

AGRICULTURAL

Chemicals

In this issue

Mixed Fertilizer Granulation
NAC Elects Hatch President
Fertilizer Round Table
Petroleum Agricultural Sprays
Bagging Equipment
Industry Outlook
Entomology Research in USDA
Report on ACS Meeting
Congress of Entomology

October, 1956



There's a Fungus Among Us

THE CASE OF THE **UNSEEN KILLER**



Verdict:

Guilty of damaging —
Cotton (damping-off)
Crucifers (club root and black root)
Lettuce (leaf drop and bottom rot)
Green Beans (root and stem rot)
Potatoes (scab and damping-off)
Alfalfa and Clover (crown rot)
Wheat seed (common smut or bunt)
Ornamentals (crown rot, black rot, stem rot,
and flower blight)

Sentence:

To be subjected to, and hence controlled by,
TERRACLOR—Olin Mathieson's new fungicide for
certain soil-borne diseases. Available as 10%,
20%, and 40% dust...75% wettable powder...
2 lb. emulsifiable. Possesses a long residual action—
one application is often effective from planting time
to crop maturity. Write for descriptive literature.

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INSECTICIDE DIVISION • BALTIMORE • LITTLE ROCK

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Parathion • PCP • Phosdrin • Phytomycin • Rotenone • Seed Protectants • TEPP • Toxaphene • Weed and Brush Killers

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Need more phosphate in a hurry? Call *International*. You'll get it fast! That's one reason so many plants depend on *International*—for here are the resources and facilities to give you extra-special service as a matter of simple routine. This service is yours to command, yours to depend on because of *International's* huge production and enormous storage capacity at mines and plants in Florida and Tennessee. You have available a full range of grades of quality-controlled phosphates and a traffic service that will meet your most exacting schedules.



for Industry

and Agriculture

quality controlled...

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- ★ for the manufacture of complete fertilizers
- ★ for the manufacture of industrial chemicals
- ★ ground rock phosphate for direct application to the soil



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INTERNATIONAL MINERALS & CHEMICAL CORPORATION

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SOIL INSECTS
COTTON INSECTS
VEGETABLE INSECTS

GRASSHOPPERS
SEED INSECTS
MOSQUITOES
CITRUS INSECTS

With this complete control you can—

- ✓ LOWER PRODUCTION COSTS
- ✓ HAVE LESS MONEY IN INVENTORIES
- ✓ SIMPLIFY MERCHANDISING AND SELLING
- ✓ CONCENTRATE SALES PROMOTION EFFORTS

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1957 National Advertising and Promotion paves the way. Heptachlor's effectiveness, widely proved at Experiment Stations and in actual use throughout the country, backs up sales.

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Export Division 350 Fifth Ave., New York 1, N.Y.



Cover Photo

Fred Hatch, newly elected president of the National Agricultural Chemicals Association and J. V. Vernon, vice president. See story on pages 36-40.

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Donald Davis

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ARTICLES

EDITORIAL	33
GRANULATION OF MIXED FERTILIZERS . . . A Study of Factors INFLUENCING GRANULATION	34
<i>By Vincent Sauchelli</i>	
NAC ELECTS FRED HATCH PRESIDENT	36
FERTILIZER INDUSTRY ROUND TABLE	41
SAFE APPLICATION OF AROMATIC PETROLEUM SOLVENTS IN AGRICULTURAL SPRAYS	42
<i>By M. J. Janis</i>	
BAGGING EQUIPMENT . . . A REVIEW	45
PESTICIDE INDUSTRY OUTLOOK	50
<i>By J. V. Vernon</i>	
ENTOMOLOGY RESEARCH IN THE USDA	52
<i>By E. F. Knipling</i>	
40 MEETINGS OF THE GEORGIA PLANT FOOD EDUCATIONAL SOCIETY	56
PRESSURIZED PLANT SPRAYS	58
ACS FEATURES AND HIGHLIGHTS	60
COMMENTS ON THE INTERNATIONAL CONGRESS OF ENTOMOLOGY	64
<i>By Charles Palm</i>	

FEATURES

IN THE SPOTLIGHT THIS MONTH	8
FERTILIZER VIEWS AND NEWS	69
<i>By Vincent Sauchelli</i>	
THE LISTENING POST	72
<i>By Kelvin Dorward and Paul Miller</i>	
WASHINGTON REPORT	76
<i>By Donald Lerch</i>	
TECHNICAL SECTION	83
INDUSTRY NEWS	88
INDUSTRY MEETING CALENDAR	111
SUPPLIERS' BULLETINS	113
PROFESSIONAL DIRECTORY	119
CLASSIFIED ADVERTISING	133
ADVERTISERS' INDEX	135
TALE ENDS	136

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**We are telling
millions of farmers**

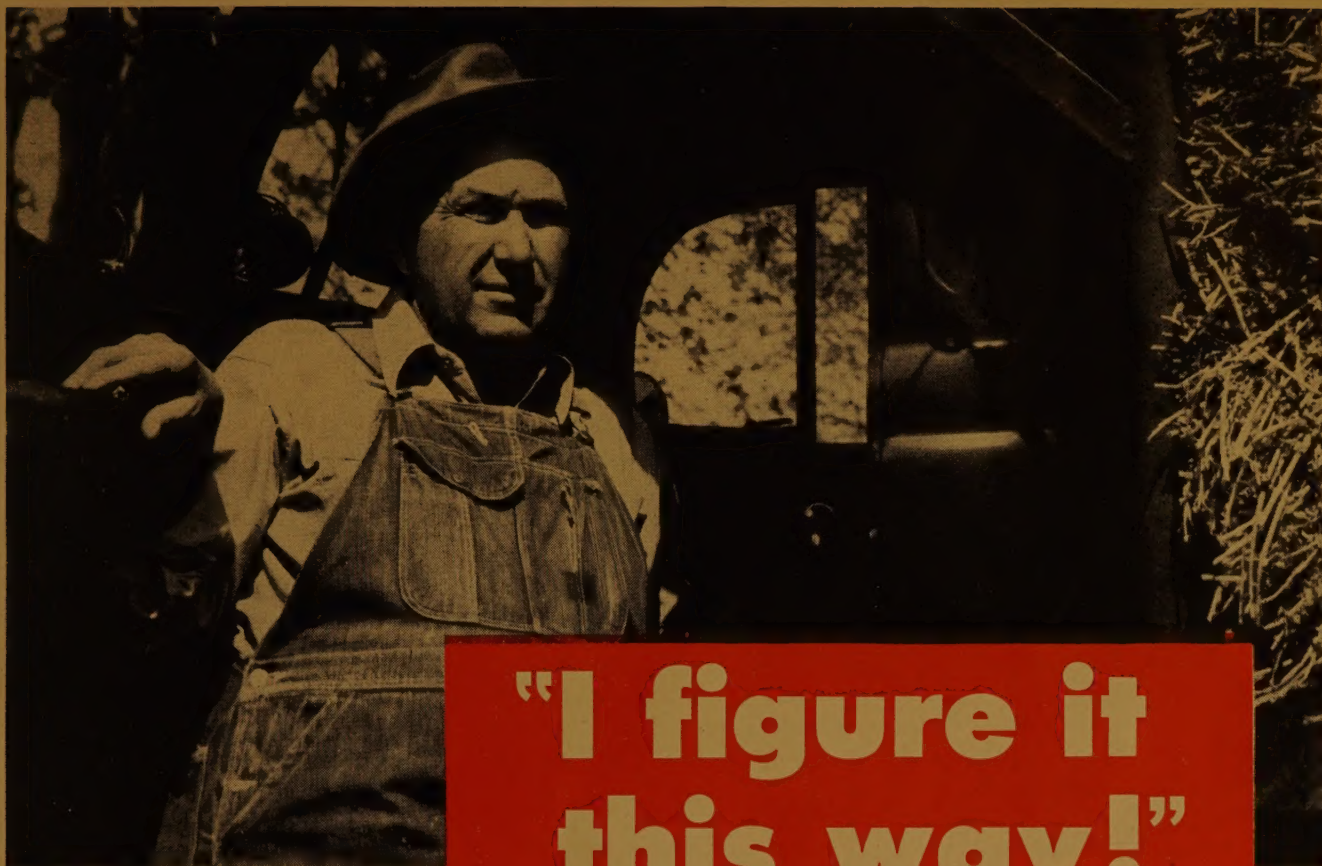
Fertilizer Grows Farm Profits

The advertisement on the opposite page is the sixth in a series in a powerful and continuing campaign directed to the attention of more than 3½ MILLION readers of farm magazines.

Nitrogen Division, Allied Chemical & Dye Corporation, is conducting this campaign to serve the best interests of the farmer, the fertilizer manufacturer, the county agent, the country banker, the experiment station, the extension service and all others interested in a profitable agriculture.

• **This campaign** is designed to be helpful to you in your efforts to serve the farmer. We trust that it meets with your approval and we greatly appreciate any comments or suggestions you may wish to send us.





**"I figure it
this way!"**

See Your County Agent



Ask your County Agent to recommend the analyses and amounts of fertilizers best suited for your crops and soils. His advice to you is based on the latest official recommendations from your Extension Service and Experiment Station.

See Your Banker



Bankers are alert to good investments. They know that fertilizer is low in cost as compared to other things the farmer buys and pays a big return in bigger yields of better quality crops. If you need money to buy more fertilizer, talk it over with your banker.

See Your Dealer



Your fertilizer dealer can supply you with a good brand of fertilizer in the amounts and analyses recommended by your County Agent. Help your dealer to get your fertilizer to you on time by placing your order early and accepting prompt delivery. Remember, fertilizer grows farm profits. *Make sure you use enough this fall!*

"When low crop prices put you through the wringer, it's no time to let up on good farming. The best way to make money is to keep your costs down. That's why I'm using more fertilizer than ever before. The extra yields I get from extra fertilizer are the lowest cost yields I produce.

"An extra 200 pounds of fertilizer per acre on wheat gives me 10 extra bushels. That's six bushels *extra profit* per acre. Because of the soil bank, I'm planting 65 acres this fall instead of 85. I'll make more money on fewer acres of wheat, with less seed and labor *and more fertilizer*.

"I'm fertilizing all my pastures to grow more feed my cattle can harvest. Grazing crops are good green feed and cost me a lot less than grain. I'm also

fertilizing my best meadow to triple my seed yield. I'll sell some grass seed next summer and I'll need some for my soil bank program.

"Most of my clay loam corn land will get fertilizer plowed down this fall. By doing this in the off season, I'll be ready to plant early next year. I plan to stick to my acreage allotment and use about \$35 worth of fertilizer per acre. With \$30 worth this year, I expect to get 95 to 100 bushels per acre. Every dollar's worth of fertilizer on corn gives me two or three extra bushels. Show me another way to grow corn so cheap!

"I don't know where crop prices are headed, but my production costs are going down because I'm using more fertilizer on every crop I grow."

The fertilizer industry serves the farmer. Nitrogen Division serves the fertilizer industry as America's leading supplier of nitrogen for use in mixed fertilizers.

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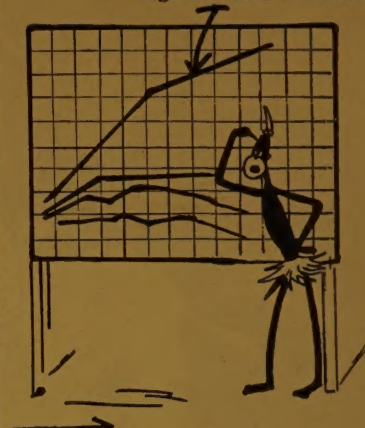
Fertilizer Grows Farm Profits



In the Spotlight this Month

- **Fertilizer Granulation . . .** A review of a set of experiments in England on the control of the size of granules in the manufacture of granulated mixed fertilizers. Results of a batch, pilot-plant unit and continuous granulation in full-scale rotary tube granulators is described. Page 34.
- **Influencing the Farmer . . .** A discussion by panelists representing the press, radio, county agent, manufacturer and dealer who gave their views on how they affect the farmer's buying habits; highlighted the 23rd annual meeting of NAC. Page 36.
- **About Petroleum Solvents . . .** Emulsified insecticide sprays containing aromatic petroleum solvents can be used for spraying crops without causing injury to the plants, providing the correct degree of emulsification is maintained. Page 42.
- **Bagging Equipment . . .** A review of the latest equipment available to the fertilizer industry for packaging in 25, 50, 80, 100 and 200 lb. bags. Comments from leading equipment manufacturers offer a comparison of equipment specifications, performance, power and space requirements, special features. Pages 45-49.
- **The Pesticide Industry . . .** Capital investment for goods and services is probably higher than in any other type of business. Inventories, plus accounts receivable represent a heavy drain on cash reserves, which must be reckoned with in the cost of doing business. These and other pertinent factors are discussed by Jack Vernon, who reports on the outlook for the industry, and its stability. Page 51.
- **Research in the USDA . . .** A complete report on 15 million dollars worth of research in entomology by the Entomology Branch of the USDA, Page 52.
- **Sulfur, an Essential Nutrient . . .** With the diminishing use of sulfate of ammonia and of sulfur pesticides, the matter of providing sufficient sulfur to soils for adequate nutrition of crops is assuming greater importance every year. Page 69.

Agricultural Chemicals



Puzzled?

You may be puzzled about what the stock market will do . . . but there can be no question about what magazine to read.

Agricultural Chemicals offers you some 60 editorial pages each month, devoted to the technical and practical developments of the agricultural chemicals industry . . . a balanced distribution of articles and news of interest to the manufacturer and distributor of insecticides, fertilizers, herbicides, etc.

A technically trained staff is at YOUR service to edit, and interpret the information YOU are interested in—news, feature articles, meeting reports.

You can't afford not to be a subscriber. Send in the card bound in on page 72 to start getting your copies now!

AGRICULTURAL CHEMICALS

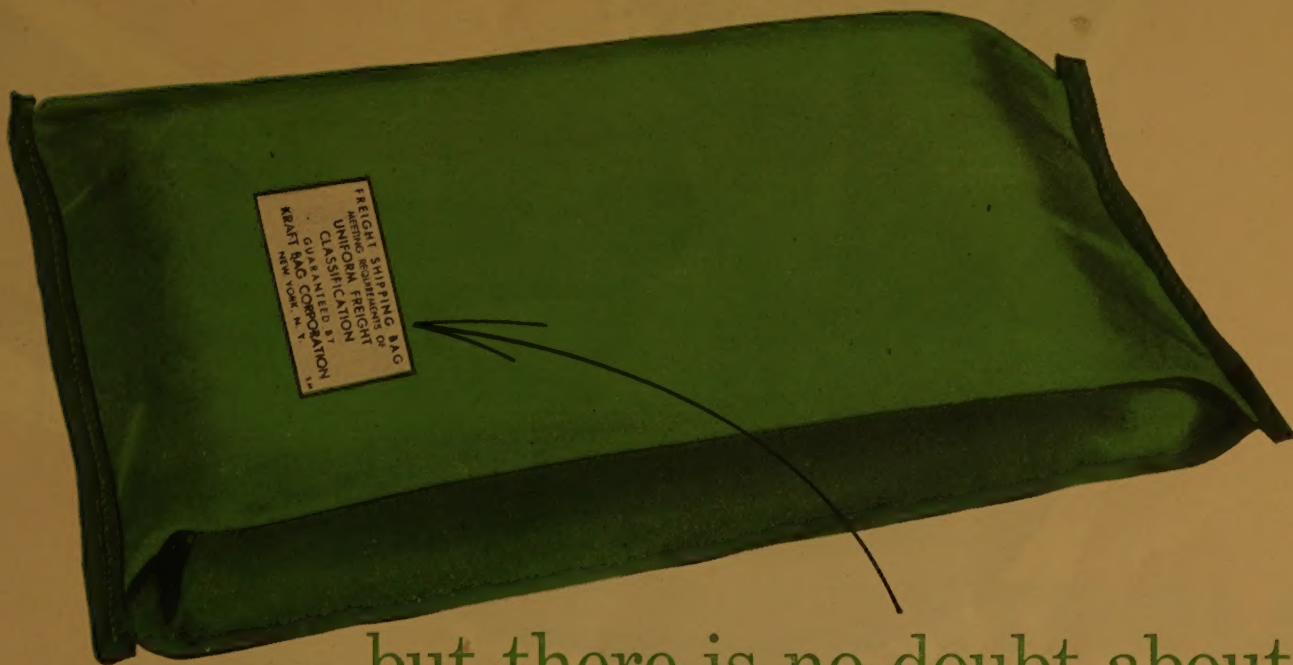
P. O. BOX 31

CALDWELL, NEW JERSEY

Cigars and Multiwall Bags



Kraft Bag Corporation, as a manufacturer of multiwall bags, is in the same position as the cigar manufacturer who complained that everything to be said about his 25c cigars had already been said about 5-centers!



...but there is no doubt about the quality of the multiwall bags that bear the Kraft Bag Corporation stamp!



Our completely integrated plants and modern facilities producing every type of heavy-duty valve or open mouth bag, are second to none!

As an exponent of true specialization, there isn't a single known or desirable time-and-labor-saving development that we haven't already either considered, initiated, adopted or built into multiwall bags we are called upon to make for America's industries, while continuing our search for still better ways to package our customers' products.

If your product can be packaged in a multiwall bag — you can depend on us to make the bag to fit your product.

Investigate
The KRAFTPACKER®
Open Mouth Bag Filling
Machine for
free-flowing material
... highest accuracy
and production...
reduces packaging costs
at an unbelievable rate.



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on those
who build
and conserve
soil fertility*

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MURIATE OF POTASH**

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RAYMOND MILLS for producing Blended Field Strength Insecticides



RAYMOND IMP MILL
Compact unit requiring minimum floor space. For making field strength insecticides and low concentrate formulations.

RAYMOND Mills provide a clean economical system for grinding, blending and classifying modern types of insecticide formulations with diluent materials for producing uniform mixtures.

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The field strength insecticide powders can be made directly from the organic chemical material. Sulphur powders and sulphur bearing insecticides can be handled safely and efficiently in specially equipped Raymond Mills.

A full range of sizes in both the Raymond Roller Mills and Imp Mills makes it possible for you to select just the type equipment required for your plant capacity and the kind of material produced.

For further details, write for
Raymond Bulletin No. 68.



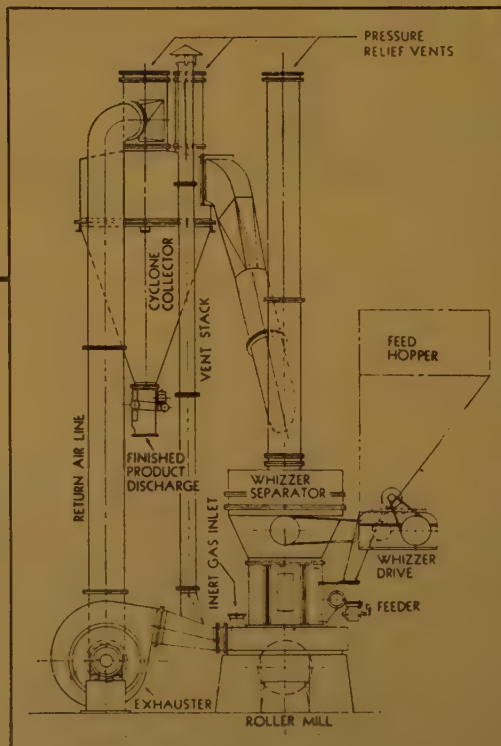
RAYMOND ROLLER MILL
All-purpose, large capacity mill for all types of insecticide dust formulations including high concentrate mixtures.

FLEXIBLE INSTALLATION

CLEAN, DUST-FREE SYSTEM

SIMPLE, EASY CONTROL

AUTOMATIC OPERATION



Flow sheet of Roller Mill specially equipped for sulphur grinding.

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HIGH FINENESS

LOW COSTS

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CHICAGO 22, ILLINOIS

Raymond Division

Combustion Engineering-Superheater Ltd. Montreal, Canada

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PRINCIPAL CITIES

**Dry dust insecticides
cost less to produce-
cover more uniformly**

when formulated with

CELITE

diatomite fillers

WHEN applying dry dust insecticides, it's the volume that counts. Yet when you buy inerts, you pay by the pound. That's why Celite saves you money because it gives you as much as 10 times more volume than equal weights of other mineral fillers.

Another important Celite benefit is the neutralizing of dense let-down agents. These usually pack down and form pockets of inactive ingredients. But when a small percentage of Celite is present its high bulking action keeps the final dust fluffed up, assuring uniform poison dispersion on any foliage.

Ask your Celite engineer to demonstrate these advantages in your plant. Call him at your nearest J-M sales office or write Johns-Manville, Box 14, N.Y. 16, N.Y. In Canada, Port Credit, Ontario.

*Celite is Johns-Manville's registered trade mark for its diatomaceous silica products



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INDUSTRY'S MOST VERSATILE MINERAL FILLER

When it comes to service, delivery

"It's a pleasure to do business with International"

Mrs. Grace Koos Anderson, *President*
N. S. Koos & Son
Kenosha, Wisconsin



International's triple has excellent condition too. Digs easier than other river barge shipments of triple, says Jack Stolar, Superintendent of the Koos plant . . .



25,000-ton storage capacity of the Koos plant for mixed goods and raw materials. The plant turns out 15 grades, including two speciality lines for lawns and gardens.

An adequate inventory of bagged materials is kept on hand at all times to meet immediate demands from the Koos' three-state sales area. Koos also sells insecticides.

Modern offices, with the original Koos homestead in the background, are the nerve center for Badger Brand fertilizer's sales in Wisconsin, Illinois and Michigan.

and quality of product . . .



MRS. GRACE KOOS ANDERSON looked out the window of her modern, wood-paneled office in Kenosha and said, "The old Koos homestead was right over there. So I guess you can say I really grew up in the fertilizer business."

This background has been paying off handsomely for her today in her management of a thriving 3-state fertilizer and insecticide business. Her wealth of experience and a close attention to details help Mrs. Anderson spot important, cost-cutting differences in service, supply and quality of suppliers.

And here are just two of the ways doing business with International has paid off for her:

Dependability of delivery: "In the many years we have used International, they have never once let us down," she says. This dependability pays off for the Koos plant by helping keep operations on schedule. It helps give them the economy of working out of box cars much of the year, without relying entirely on their 25,000-ton storage capacity. "Cuts handling costs, too."

Shipping service: "We're realizing freight savings right now by using International's barge shipments to Joliet, Illinois, and then by rail to Kenosha," she says.

Jack Stolar, superintendent of the Koos plant, outlines other advantages of International's triple. Stolar, who has managed two other midwestern fertilizer plants, says, "International, on the whole, has been a better triple than the rest. It digs easier when shipped up in barges and its texture is a little better."

If you have not already tried International's service — and International's superior triple superphosphate — why not put us to the test.

You'll find that International's is the triple with that "something-extra" quality that helps you cut costs . . . gives you better control of manufacturing conditions . . . helps stabilize your formulation problems . . . and will reduce the delivered unit cost of (P_2O_5).

So this year, for a better product and service you can depend upon, look to International Minerals & Chemical Corporation. You'll be glad you did.



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INTERNATIONAL MINERALS & CHEMICAL CORPORATION

General Offices: 20 North Wacker Drive, Chicago 6



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Lemons	Cabbage	Pecans
Seed Alfalfa	Apples	Almonds
Beans	Pears	Ornamentals
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Broccoli	Strawberries	Fruits

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GRANULAR

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Whatever grade you require, you can depend upon your Bradley & Baker representative to arrange your shipments for prompt, reliable delivery of a product superior in quality, uniformity and strength. Call upon him today.

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TRIPLE SUPERPHOSPHATE

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Production Manager



...the bag filling operation is running much better. The men like the way they handle and report far less breakage. The saving in time more than justifies our going over to them."

Purchasing Agent



...After our Production Manager left, I decided to make another good move—and made a note on my calendar pad.

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ARK "Arksafe" Bags 15x5x39 1/60 1/70 cotton filler cord	62750	198.70M	

*Tell Ryan
Mark Records
Arkell Safety
Bag Co. 1st Choice
for Multi-walls*

TUESDAY

OK



Prove to Yourself the **3** Advantages of **TRITON X-151 and TRITON X-171**

• Storage Stability • Performance • Simplified Operations

Emulsifiable concentrates with excellent *storage* stability and performance are made with TRITON X-151 or TRITON X-171.

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or in conjunction with each other. These two TRITON emulsifiers offer outstanding spontaneity and stability to pesticide emulsions. Their versatility enables them to handle a wide variety of toxicant-solvent systems in waters of varying hardness.

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Chemicals for Industry

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Representatives in principal foreign countries

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Give 3 way protection
against sifting

DOUBLE-FOLD HEAT SEAL

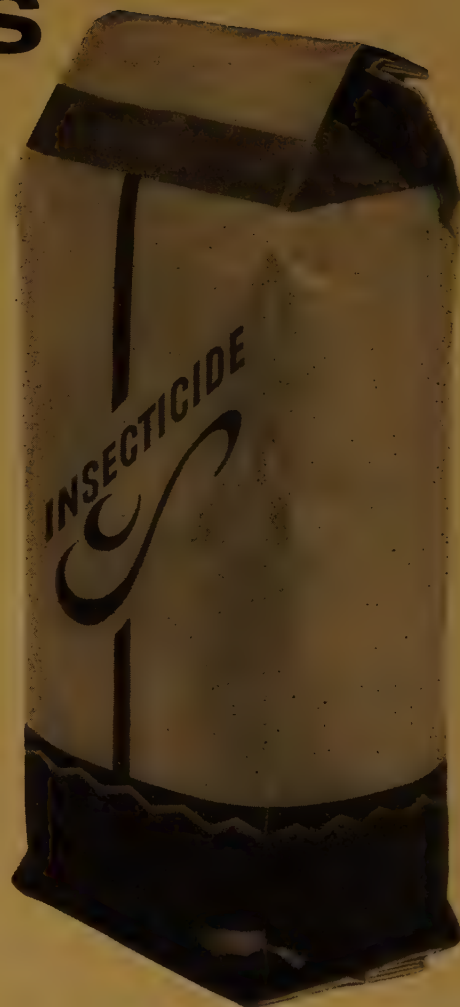
Easy, safe closure
for filled bags

DUOTITE BOTTOM

Double folded heat seal
absolutely will not
permit sifting

INNER LINING

Natural kraft or
special lining for
extra protection



You assure your customers of full measure and safe delivery of dry chemicals — even sift-prone and poisonous powders — when you pack them in Duotite bags.

Duotite bags are made with strong Kraft outer wrappers and lined with a wide selection of papers and films to suit your product. They are designed to enable you to make sift-proof closures — heat sealed if preferred. Bottoms are double folded — heat sealed and pasted to give positive protection against sifting.

Continental makes a complete line of packages for special chemical products. Call on us for the answer to your specific packaging problem.



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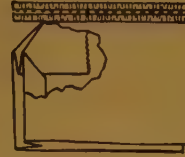
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QUALITY PRINTERS AND CONVERTERS OF FLEXIBLE PACKAGING MATERIALS

AGRICULTURAL CHEMICALS

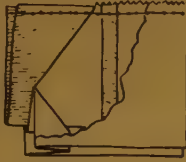
LOOK what Fulton can do for you with a paper bag!

Fulton's sewn multiwall bags can be ordered with regular valve,



a creped

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stacking without slipping. Ful-Flex® Elastic Multiwalls—low-cost replacements for

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paper . . . can be moisture-proofed



with a special barrier ply . . . are

strong, easy to handle, convenient to store. WPPL (Water Proof Paper Lined) textile

bags with paper or polyethylene



laminations keep out dampness, retain

proper moisture inside. Or if you have other difficult packaging problems,



Fulton's Special Services Division will assist

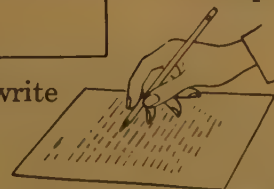


in developing a package

that suits you perfectly. Just call



or write



your nearest

Fulton branch today.



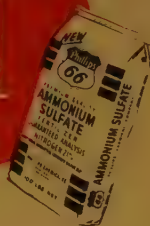
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LOS ANGELES • MINNEAPOLIS • NEW ORLEANS • NEW YORK • OKLAHOMA CITY
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5

PHILLIPS

Fertilizer Materials for High Analysis Mixtures

1



AMMONIUM SULFATE

New Premium Quality Phillips 66 Ammonium Sulfate contains 21% nitrogen, 23.8% sulfur. It is dry-cured to remove excess moisture, prevent caking. Uniform dust-free crystals flow freely, mix easily. Ideal for all analyses of mixed goods and for direct application. Available in bags or bulk.

2



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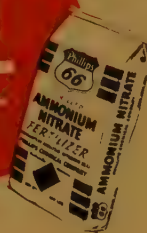
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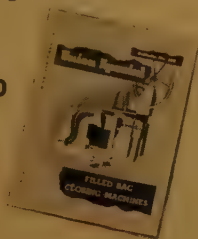
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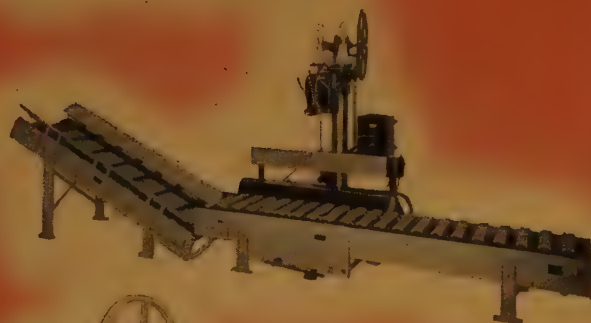
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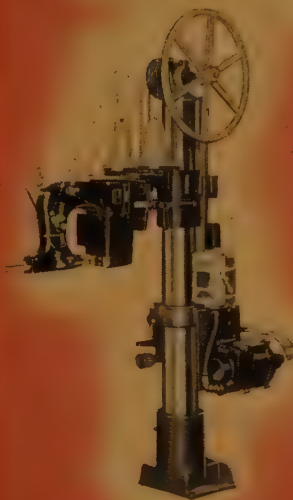
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CLASS 21800 (left) for fast, economical closing of paper bags. Illustrated is Style 21800 H with 5 ft. conveyor and 80600 H sewing head for making tape bound closure. Tape is cut off automatically at each end of closure. Sewing head and conveyor adjustable vertically.

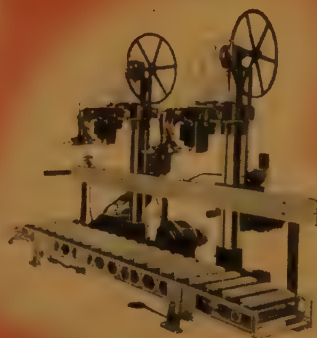


CLASS 20500 (above) machines are heavy duty, high production units for closing medium and heavy weight bags. Available with power-driven horizontal conveyor, inclined conveyor, or both; or with conveyor transmission unit only, for plant production line.



STYLE 20100 H (left) is a heavy duty, high production column type machine designed for use with plant conveyor systems. Sewing head is pedal controlled.

DUPLEX MACHINES (right) are designed for closing double bags. The first sewing head closes the inner bag; the second closes either the outer bag alone, or both bags together for extra safety. Also recommended for single closures where continuous operation is a must — operator can instantly switch to other head.



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Chemical Processing Staff Photo

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For complete technical data, write the nearest office of Fairfield Chemical Division, Food Machinery and Chemical Corporation. Branches in Principal Cities. In Canada: Natural Products Corporation, Toronto and Montreal.

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* The cotton plants on the left, grown from THIMET-treated seed gained a tremendous growth advantage over the cotton in the two rows at the right, which was grown from untreated seed. Photo was taken 9 weeks after planting.

Early in 1956, cotton growers in Mississippi and Texas had their first opportunity to buy cotton seed treated with THIMET, Cyanamid's revolutionary new systemic insecticide. After the first season of commercial use, field reports indicate a high degree of grower success with THIMET-treated seed, and preparations are well under way for greatly increased use in 1957.

THIMET, applied to the seed by commercial seed treaters, is taken up into the plant and gives the plant "built-in" protection against thrips, aphids and spider mites during the critical early weeks of growth. These are the insects which stunt, deform and retard the growth of young cotton. *The plant protects itself against insect damage* for the first 4 to 7 weeks of the growing season, eliminating the cost, time and labor involved in applying the 2 to 4 sprays or dusts ordinarily necessary to control these pests. It also eliminates the worry of *when* to spray or dust.

THIMET has been accepted for use on cotton by the USDA which reports that it has "proved highly effective in controlling early-season pests." Extensive field-testing is continuing and may result in acceptance of THIMET for use on other crops as well.

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Editorial

COMMENTS



THE science of pest control has grown remarkably in complexity over the past ten or twenty years. Instead of just a few simple and widely used pest control materials, now there are dozens of pesticides which may be employed and the degree of control will vary widely depending on what choice the control expert has made.

With the problem of resistance to pesticides growing more serious, control promises to be even a more complex problem in the future. Entomologists attending the Entomological Congress held in Canada last month expressed major concern, and many lean to the view that over coming years chemical controls may become less and less effective. They advise increasing attention to other control measures, at least to supplement chemical controls, both to help make them more effective and to extend the useful life of new pesticides.

One expert, whose experience is world-wide, believes that the future of pest control may lie in a balanced program which will combine use of systemic pesticides with carefully balanced employment of attractants, biologic measures, pest diseases, etc. He has developed and put into practice a plan of "balanced arthropod populations" in which the goal is to destroy only a carefully calculated percentage of the pests, leaving as a remainder a population which can be controlled by natural predators, and sufficient in quantity to support the predators. The over-all plan is to achieve a balanced population of pests and predators, and to avoid the use of pesticides in such a manner as to create further development of resistance. He points out that, with the cost of development of a new pesticide run-

ning up into the millions, it is a long gamble for an insecticide manufacturer to develop a new product and put in an expensive plant to produce it, when there is the obvious danger that the product may lose its effectiveness before the plant is even paid for.

Admittedly there is great danger that the supply of new pesticides coming off the experimental lines may not be as ample over the next ten years, as it has been over the past ten years. We are still getting new products today, but these are in large measure products on which the brain work began three or four years ago. It would be interesting for the industry to know on how many new products work has started since passage of the Miller Law. Will the development pipe lines run dry in a few years? And if they do, will the industry still be able to achieve the required degree of pest control when it can no longer count on powerful new weapons to add to its arsenal year after year?

For the present, chemicals are doing the control job practically single handed. And if they fail, there is considerable question that these other systems, which may sound all right in theory, will actually work in practice. Some of the men directly concerned with control problems are quick to pick holes in the theories that suggest by-passing or making more restrained use of chemicals. Suppose we plan to kill off just seventy-five percent of an infestation, they ask, leaving the balance of the pests for the natural predators to feed on, but something goes wrong? Perhaps we kill only fifty percent, or perhaps the predators go into an unexplained decline that season. Who explains to the farmer what is happening to his crop?

A MOST interesting set of experiments on the control of the size of granules in the manufacture of granulated mixed fertilizers was described by A. T. Brook (Messrs. Fisons Ltd., Great Britain) at the Sept. 24-26, 1956, I.S.M.A.* Conference, held at Lausanne, Switzerland. Some of the highlights of this investigation are given in the following all-too-brief digest of the presentation.

The research attempts to relate the results of the batch, pilot-plant unit with continuous granulation in full-scale, rotary tube granulators. The fertilizer materials used in formulation comprised normal and triple superphosphates, sulfate of ammonia, and muriate of potash—all requiring the addition of water for granulation and hence subsequent drying to effect hardness in the granules.** The workers realized that there is a wide difference in the characteristics of a full-scale continuous operation and those of the experimental batch units. However, they also realized that owing to the many variables involved in this kind of study it was not practicable to conduct the investigation with commercial units.

First essentials

- a. Raw materials should be uniform as to particle size and quality; for example, moisture content. It is not possible to get a product of good quality if the mixture varies in constitution from minute to minute.
- b. *Segregation*—Granulation by addition of water starts as soon as the mix is placed in the test granulator. In commercial practice, however, handling of the materials after mixing and before they reach the granulator results in some segregation, the amount depending upon the size range of the raw materials. Segregation may also occur in the granulator when tumbling begins and before the water is added.
- c. *Uniformity in rate of flow*
In a commercial unit, water

is added at a more or less uniform rate of flow at one or more fixed points. To insure uniform wetting, the rate of passage of the mixture beneath the sprays should also be uniform. Otherwise, some portion of the materials may become more wetted than adjacent portions and become lumpy and less mobile due to its failure to move as fast as it should. Thus it will form a sort of weir at that point and get still wetter.

Finally, the material behind it builds up a head to a size so that it is able to push the temporary obstacle away. The subsequent rate of flow of the dry material is temporarily increased. Gradually normal flow becomes re-established. But meanwhile, the harm has been done, in that some portion of the mix has been over-wetted, some not enough and the result is oversize and fines. The same situation may arise if the raw materials have not been thoroughly mixed. The result here is non-uniform progress through the granulator tube.

d. *Uniform wetting*

Materials having very fine particles may suffer from "slippage," that is, the material refuses to be "gripped" or lifted by the rotary action of the granulator. What develops is described as a saw motion of the mass, up and down the shell, but in which the constituents of the mass are relatively at a stand-

GRANULATION of MIXED FERTILIZERS

— A Study of Factors Influencing Granule Formation

still. If the bed of material in the tube becomes static or stops cascading uniformly beneath the spray, some parts will become wetted more than others with the result that granulation suffers. If the tube does not turn rapidly, it will produce a rolling motion minus the cascading effect. Hence, we see how interdependent are uniform rate of flow and uniform wetting in a continuous tube granulator.

Correct rolling in the tube

Wetted fertilizer materials in a tube granulator tend to stick in the corners of lifters. After building up for some time they will often fall away in large lumps, again promoting oversize. The larger the tube the less the centrifugal force and lifting action for a given peripheral speed. Hence, it is that a small diameter shell rotating at high speed and having ample inclination favors the wetting process more so than a shell of large diameter rotating slowly, which produces a deep bed of material and

prevents the uniform wetting of all particles.

Some observations based on experiments in a batch granulating test unit

The tests were run to determine the effect on granulation and granule size of the following factors: speed of rotation of drum; growth of granules in drier; time of retention in the granulator; water requirements of different mixtures; particle size of sulfate of ammonia; addition of fines to raw materials; sprays versus jets for addition of water; and positioning of water sprays.

Because in the United Kingdom fertilizers based on superphosphates are sold on their water-soluble P_2O_5 content, manufacturers there allow the superphosphate to "cure" for at least 2 weeks before using it for granulation. As a consequence, the super is cold and less plastic, but it does attain its maximum water solubility which is not affected by subsequent granulation and drying if temperatures are kept reasonably low. Continental practice is to granulate with super fresh from the den when

it is hot, moist and plastic. It may not be necessary then to add water or to use heat for drying the granules.

a. Speed of drum rotation:

The speed of movement of particles has to be such as to distribute the spray water uniformly within the mass while producing sufficient shearing action to break down over-size particles.

It is believed that agglomeration of particles in a rotating tube follows definite laws and responds to correct conditions.

b. Growth of granules in drier:

Increase in temperature and moisture content will promote the agglomeration of particles in mixtures based on superphosphates. Granulation of cold, raw materials is accomplished by adding water with subsequent drying in a concurrent drier. The art of granulation requires experience and keen observation to enable the operator to judge when he has the correct degree of agglomeration ex-granulator. Differences in formulations will influence the growth of granules in the granulator; growth occurs also in the drier.

c. Time of retention in granulator:

If the rolling time in the granulator is varied, what effect does it have on granule formation? The results of numerous tests showed: granule size depended entirely on the rolling action in the drier and was independent of the amount of rolling obtained during the wet stage immediately following the wetting process, provided the spray water is correctly distributed during the wetting phase. The researchers found

that a retention period of $2\frac{1}{2}$ minutes in the granulator was adequate.

d. Water requirements of different mixtures:

The addition of water is one of the few controls used by the operator to regulate the size of granules. Most operators fail to appreciate the critical nature of this sensitive control and over-correct for water addition. Different formulations require different amounts of water. To illustrate how sensitive this control can be, the investigators cite this one among many examples: the initial water content of the 0-19.5-19.5 mixture was 8.25%; the size range of the final product was to be within the 1.5mm to 4mm size; the final granulated product obtained after adding 7.15%, 7.6% and 8% respectively of water showed efficiencies of 66%, 88% and 39% respectively; that is, for each of the water additions, the per cent of granules falling within the mentioned size range was as shown. In other words, the differences in the amounts of water added in this test represented only 10 gallons per hour on a 10-ton-per-hour plant basis out of a total addition of water of 170 gallons per hour, yet the efficiency in building up the desirable range in size of granules was so variable.

In another test using a 9-9-15 mixture with similar differences in the addition of water (or 1 gallon per ton of product), fairly wide variations in water could be made without significantly affecting the percentage of granules within the required range of 1.5 to 4 millimeters. This shows the influence of the superphosphate, the lower the proportion the lower the sensitivity to additions of variable amounts of water.

e. Effect of particle size of sulfate of ammonia:

The effect of particle size of sulfate of ammonia on granule size when granulating with cold water was found to be of major importance. The reasons advanced by the investigators for this effect are: fine soluble salts generally require more water addition for a given degree of ag-

(Continued on Page 131)

A Review

by Vincent Sauchelli

Davison Chemical Co.
Baltimore, Md.

*International Superphosphate Manufacturers Ass'n Conference, Sept. 24-26, 1956.

**The British fertilizer industry does not utilize ammonia solutions to ammoniate superphosphates as is customary in American practice. U.S.

A PANEL discussion on "Who and what influences the grower in his selection and use of pesticides" drew maximum attendance at the 23rd annual meeting of the National Agricultural Chemicals Association, held September 5-7, at the Essex & Sussex Hotel, Spring Lake, N. J. Other features on the program included discussions on the Miller Amendment, a highway weed-control program, entomology research, and the outlook for industry. The NAC staff gave a graphic review of "What NAC does with your dollar."

Highlight of the three-day session was the election of Fred W. Hatch, manager of Shell Chemical Corporation's agricultural chemicals division, as president of NAC, to succeed W. W. Allen of Dow Chemical Co. Jack V. Vernon, Niagara Chemical Division, Food Machinery & Chemical Corp., Middleport, N.Y., was elected to succeed Mr. Hatch as vice president of the Association.

W. W. Allen, retiring president of the Association, addressed the conference the first morning, and reported on some of NAC's activities. He emphasized that NAC performs a function of great value to the industry, and does so at bargain prices. "It is in an effort to buy more of that bargain that we (NAC) are broadening our operations, stepping up our efforts, and assessing higher dues upon our members." Mr. Allen outlined some directions of increased effort to include: a greater safety program; industry wide action to interest

Sales Influences

Studied at

more young men of ability to enter the agricultural chemicals industry; and third: assistance to states on legislative matters, drafting state regulations and laws bearing upon agricultural chemicals.

Information Panel

THE farmer's five main sources of agricultural information: farm press, farm radio and television, company sales managers, the Agricultural Extension Service, and dealers were represented in a panel moderated by M. R. Budd, Hercules Powder Co., Wilmington, Del., and organized to tell NAC members what they thought were the factors most influencing the farmer. Each participant, needless to say, voiced the opinion that his medium has a highly significant bearing on the farmer's choice of what to buy.

Blanchard Smith, Chipman Chemical Co., Bound Brook, N. J., one of the panel members, introduced a factor not mentioned by anyone else in the group: the farm leader, the

man selected by the farmers themselves to follow in practice. Mr. Blanchard described this man as the "highly influential grower in a community. He is the successful and aggressive type of individual who is willing to take on the new and spread its gospel across the fence to friends and neighbors."

Mr. Blanchard representing the company sales managers, agreed that many varied factors influence growers in the selection and use of pesticides. He then proceeded to describe three commercial outlets selling the farmer, which come into direct contact with the farmer. These are the commercial applicators, commercial scouts and local dealers.

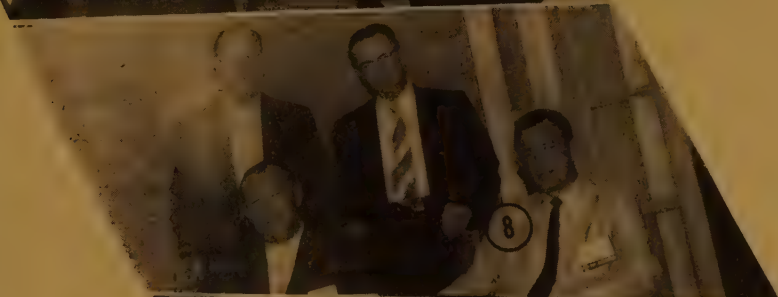
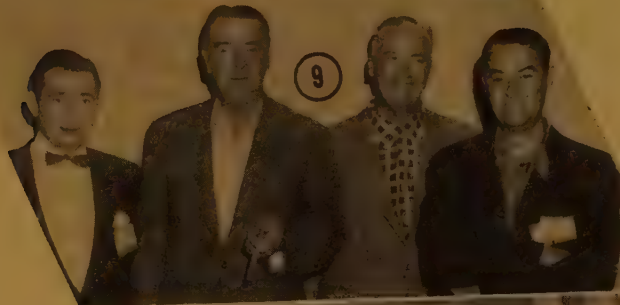
Speaking of the commercial applicators, Mr. Smith said, "these are ground or aerial applicators. Because of the wide experience, growers lean very heavily on them to suggest what materials to use. These people have a very great influence as to the type and brands of materials which are purchased by their customers."



NAC

Meeting

- (1) **Seated:** Geo. Simches, Planters Chemical Corp.; Ken B. Nash, Olin Mathieson Chemical Corp. **Standing:** Edward H. Phillips, G. L. F. Soil Building Service; Joseph Skaptason, Pittsburgh Agricultural Chemical Co.
- (2) A. F. Bixby, Pennsylvania Salt Manufacturing Co. of Washington; Carl Behse, Agricultural Chemicals, Inc.; Al F. Fuchs, Atlas Agricultural Chemicals, Inc.; C. G. Whinfrey, Pennsylvania Salt Manufacturing Co. of Washington.
- (3) Mr. and Mrs. Silas Besthoff, Faesy & Besthoff, Inc.
- (4) Logan Grupelli, Nopco Chemical Co., Inc.; Jack Miller, Atlas Powder Co.; V. L. Rebak, Grace Chemical Co.; K. Krausche, Floridin Company.
- (5) D. W. Phelps, J. H. Kennedy and George O. Voss, all of Stauffer Chemical Co.
- (6) W. R. Peele, W. R. Peele Co.; Wm. Winans, Southeastern Clay Co.; W. Andrews, W. R. E. Andrews Co.
- (7) R. S. Davidson, Battelle Institute; W. W. Allen, Dow Chemical Co.; Frank Seeland, S. B. Penick & Co.
- (8) **Standing:** Harry Johnson, Triangle Chemical Co., and D. F. Murphy, Rohm & Haas; **Seated:** I. R. Burden, United-Heckathorn; R. W. Wirt, Minerals & Chemicals Corp.
- (9) D. G. Bennett, Phelps Dodge Refining Corp.; R. B. Stoddard and John A. Rodda, Fairfield Chemical Div.; Ralph Dorland, Agricultural Chemicals.
- (10) E. H. Georgi, United Co-Operatives, Inc.; Cameron Siddall, Pennsylvania Salt Manufacturing Co. of Washington; Jack W. Moore, Floridin Co. and James D. Hopkins, Hopkins Agricultural Chemical Co.





The commercial scouts, he said, "are well-trained entomologists, agronomists, or pathologists who, by the nature of their work, must keep abreast of the new developments in the pesticide field. It is the responsibility of these men to see that their customers' crops are kept free of disease, damaging insects and weeds.

While the influence of the local dealer is broader than that of either of the other two groups, Smith said, in his opinion, the local dealer's "influence is much less intense. A very high percentage of our dealers simply follow the state guide and carry in stock one or more brands of the types of materials recommended in the guides. The influence of these men is unquestionably much greater than that of the commercial applicator, but on a smaller scale."

William A. Haffert, Jr., Editor, *New Jersey Farm and Garden*, representing the farm press, told the audience that when trying to sell anything to farmers, "Be ready to prove that what you sell can make a farmer more money or can satisfy his pride."

Haffert added that the information directed to farmers should be regionalized. What is written for one area often fails to apply to other areas, he said. For that reason, "printed material should identify successful local farmers and successful local practices with a particular brand of pesticide."

As to where farmers get their information, Haffert said, "There have been 13 official efforts in the past 30 years to study farmers' sources of information. As a general rule, the nation's 275 agricultural publications of all sorts have towered over the next most potent media by at least 50 percent."

Noting that the "mediocre" farmer sometimes takes up to 10 years to adopt a new farm material or farm practice and that he is influenced by many sources of information in that time, Haffert said, "I believe it is the teamwork of all agencies — manufacturer, publisher, dealer, state and county extension people, radio, television, direct mail and all other types and means of communication, that gets the job done."

The teamwork theme was backed up by Dr. Ellsworth Fisher, Extension Entomologist, University of Wisconsin. Dr. Fisher pointed out that between the time a farmer becomes aware of a new practice and the time he adopts it, there are intermediate stages of interest, evaluation and trial. "Guidance to a successful trial will bring satisfaction and more rapid acceptance," he said.

Speaking on the work of the Agricultural Extension Service, Dr. Fisher continued, "The Agricultural Extension Service is charged with the job of influencing growers to practice

(1) M. J. Bunnell, Geigy Agricultural Chemicals; A. G. Rauber, Michigan Chemical Corp.; Clark Bellamy, Acme Fertilizer Co.; George W. Ahl, Summit Mining Corp.

(2) Standing: E. K. Plant and W. F. Newton, Columbia-Southern; H. W. Lee, Niagara Chemical Div., Food Machinery & Chem. Corp.; R. Wayne Yoder, American Cyanamid Co. Seated: Jack V. Vernon, Niagara Chemical Div., Food Mach. & Chem. Corp.; T. L. Wilkerson, American Cyanamid Co.

(3) W. T. Lemmon, McConnon & Co.; R. Whittinger, Wm. Cooper & Nephews; Jack Watson and L. W. McCallum, J. M. Huber Corp.

(4) C. Kampmeier, Rohm & Haas Co.; E. H. Ginn, Hercules Powder Co.; A. Weed, Olin Mathieson Chem. Corp.; P. Truitt, National Plant Food Institute.

pest control which research and practical application have proven sound."

Noting that "more people become aware of new ideas through mass communications media than from other sources," he said. "Pest control shares well in the figures for 1955 which show that county extension agents had a total of 823,079 news articles published, 20,325 television appearances made, and there were 227,522 radio broadcasts."

John McDonald, farm director, Station WSM, Nashville, Tennessee, and president of the National Association of Radio and Television Farm Directors, stressed the role of the radio and television farm director as a man who is on a personal basis with the farmer.

"The Farm Director isn't an eight-hour man," McDonald said. "He is in the field constantly, either getting information, visiting with dealers and farmers, or making speeches to groups of young potential customers." Stating that all this helps the farm director to speak the farmer's language, he added, "The farmer must have confidence in the farm director he listens to—and remember this: they are a skeptical group."

Noting that "twenty-eight percent of all radio stations program more than five hours per week to farmers," McDonald concluded, "Farm men spend twice as much time per day listening to radio as they do with T.V., newspaper and magazines, and the percentage is even higher with farm women. So we think the Radio Farm Director is the key to the farm market."

The voices of thousands of retail pesticide dealers were represented by F. W. "Chief" Jones, of Muleshoe, Texas. Jones stated that mass communications media "create a certain amount of interest or curiosity in the mind of the farmer . . . But when the farmer gets ready to purchase insecticides, he comes to his retailer, not to the place that advertised the product."

"The farmer is interested in what the man that takes his money—the man who speaks his language—the man who dons his overalls and goes out in the cotton fields and helps him with his insect problems—what that man thinks about this or that kind of insecticide and the opinion of that man, honestly and thoughtfully given, will, nine times out of ten, influence his buying."

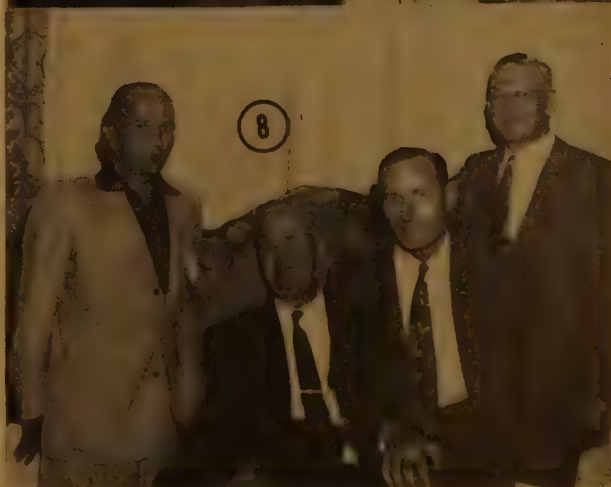
He added, "By coming to me the farmer has made his final decisive step. He is ready to purchase insecticide, and he believes I can tell him which insecticide and how to apply it. In the end, it is the hometown retailer who makes the decision for the ultimate consumer, and I am

(5) A. W. Loughheed, Naugatuck Chemicals; T. W. Reed, California Spray Chemical Corp.; W. E. Dove, Fairfield Chemical Div.; G. L. Frear, Allied Chemical & Dye Corp.

(6) Dr. and Mrs. George C. Decker, University of Illinois; J. E. Bussart, Velsicol Chemical Corp.; Dr. and Mrs. H. H. Shepherd, U. S. Dept. Agriculture.

(7) E. N. Shelton, Tennessee Corp.; W. J. Gehweiler, R. T. Vanderbilt Co.; R. J. Zipse, Olin Mathieson Chem. Corp.; L. S. Kaniecki, Tennessee Corp.

(8) H. J. Grady, California Spray Chemical Corp.; C. O. Barnard, Western Agricultural Chemical Association; E. F. Knippling, USDA, Entomology Research Branch; E. W. Cannon, California Spray Chemical Corp.





Panel discussing "Who and What Influences the Grower in His Selection and Use of Pesticides": W. A. Haffert, **New Jersey Farm and Garden**; Chief Jones, Farm Chemicals Dealer; M. R. Budd, Hercules Powder Co.; John McDonald, National Association of Television and Radio Farm Directors; Blanchard Smith, Chipman Chemical Co.; and Dr. Ellsworth Fisher, University of Wisconsin.

proud of the confidence placed by farmers in their local insecticide retailers."

Report on the Miller Law

AN account of the Miller Law,—its effects on research, new developments, a further definition of its requirements etc, was reviewed in a panel discussion the third day of the meeting. W. B. Rankin, Food and Drug Administration, Washington, D. C., commented on some further work to be done under the new law. He indicated that "there have been some trouble spots . . . particularly with regard to forage crops. It has not been possible to establish tolerances for some of the pesticide chemicals that are widely recommended for use on forage. We are working on this problem now," he advised, "and hope it will be resolved before the next growing season."

Mr. Rankin indicated also that the Food & Drug Administration would like to continue in 1957 the "follow the label" educational program. He reported too that growers who followed registered label directions in the 1956 growing season have not had legal trouble because of spray residues.

Discussing some of the problems and unanswered questions currently confronting research workers, extension personnel and farmers, Dr.

George C. Decker, Illinois Natural History Survey, Illinois, reported that "although there are some rumblings of discontent, by and large there seems to be general agreement that the bill has been working out as well as could be expected and with a minimum of dissatisfaction."

Among the accomplishments of the Law, he said, are: a reasonable assurance that as rapidly as the required data can be accumulated, additional tolerances can be obtained without undue delay; and the requirement for convincing evidence of necessity for use formerly required for tolerance applications is now replaced by the certification of usefulness by the Secretary of Agriculture.

"What are some of the unsolved problems?" he asked, "To assume that all of the many complex problems involved could be solved in a year or two would have been optimistic and unrealistic indeed. Thus, it is not surprising that we find ourselves confronted with a variety of minor and some major unanswered questions.

"The multiple tolerance situation in which different tolerance levels are established for the same pesticidal chemical on different crops is confusing, and in the opinion of many indefensible in most cases, except where great differences in moisture content, or the extent to which certain commodities appear in the diet,

justifies suitable adjustments." The across-the-board tolerances awarded many materials following the 1950 hearings allow considerable leeway which can be used to expand and otherwise modify spray schedules without danger of exceeding tolerances. "In contrast," he continued, "many materials developed later were often tested under conditions of restricted usage where residues were held to unrealistically low levels. As a result they are now handicapped and have little or no flexibility in their use because they were awarded a tolerance based largely upon apparent residue requirements rather than safety.

"These inequities are exceedingly embarrassing to research and extension workers and are difficult to explain to the farmer. In looking to the solution of this problem, we can only urge that where the margin of safety is adequate, serious consideration be given to the establishment of tolerances at levels that will allow for some flexibility in control practices to meet the variable contingencies that are inevitable."

Dr. Decker discussed also the question of meat, milk and forage residues, pointing out that "currently the farmer is in a position where he must tolerate sizeable losses that could be eliminated, or risk running into conflict with the law. It is urgent," advised Dr. Decker, "that some decisions be made on this question at the earliest possible date.

"We must strive to simplify rather than further complicate our pest control recommendations and practices. Today even the best informed research and extension specialists find it difficult if not indeed impossible to prepare recommendations that will adequately protect several important crops and at the same time fully comply with all labeling and tolerance requirements. Furthermore, if all of the necessary ifs and ands are inserted, the document becomes unintelligible to the average layman for whose use it was prepared. If we continue to further complicate the making of pest control recommendations by pyramiding ex-

(Continued on Page 121)

PROGRAM FERTILIZER INDUSTRY ROUND TABLE

TUESDAY, OCTOBER 16

Moderators: V. Sauchelli, H. L. Marshall

- 9:30 A. M.-1:30 P. M.—Registration
- 1:30 P. M. Sampling of Fertilizers and Materials
J. Archer, Int'l. Minerals & Chem. Co.,
D. Sanders, Swift Fertilizer Works
- 2:00 P. M. Automatic Dry Sampler
P. E. Cook, Denver Equipment Co.
- 2:30 P. M. Triple Super Analytical Study
H. L. Marshall, Olin-Mathieson Chem. Corp.
- 3:00 P. M. Statistical Quality Control
H. Replogle, Davison Chemical Company
- 4:00 P. M. Equipment for Analytical Laboratory: Demonstrations
Robt. Piper
- 5:00 P. M. Adjournment

WEDNESDAY, OCTOBER 17

Moderator: V. Sauchelli

- 9:30 A. M. Changing Technology in Granulation and Ammoniation
T. P. Hignett, T.V.A.
- 10:00 A. M. New Developments in Ammoniation and Granulation
E. Perrine, Nitrogen Div. Allied Chem. & Dye Corp.
- 10:30 A. M. Raw Materials in Processing Granulated Fertilizers
R. D. Tayloe, National Potash Co.
Joe Sharp, Spencer Chemical Co.
W. L. Hill, U.S.D.A.
J. O. Hardesty, U.S.D.A.
- 12:30 P. M. Lunch: Potash Co. of America—host
- Moderators: H. L. Marshall, J. E. Reynolds
- 1:30 P. M. Sackett New Star Granulator
A. Spillman, Fertilizer Mfg. Cooperative
- 2:00 P. M. Flowrators and Flow Control
A. Behler, Fisher Porter Co.
- 2:30 P. M. Temperature Control in Granulation
Brown Instr. Div., Minn. Honeywell Reg. Co.
- 3:00 P. M. Feeders and Weigh Belts
Wallace & Tiernan, Inc.
- 3:30 P. M. Electrical Automation
Warren Seiffe, Link Belt Co.
- 4:00 P. M. Instrumentation in Dryer Design
Louisville Dryer Co.
- 4:30 P. M. ABC's of Screen Analysis
Wayne King, W. S. Tyler Co.

THURSDAY, OCTOBER 18

Moderators: J. E. Reynolds, V. Sauchelli

- 9:00 A. M. The Dorr Ammonium Phosphate Process
Mack Barber, Mo. Farmers Assoc., Plant Foods Div.
- 9:30 A. M. Davison Trenton Granulation Process
J. E. Reynolds, Davison Chem. Co.
- 10:00 A. M. Dust and Fume Control in Granulation Processes
Glen Rose, Davison Chem. Co.
- 10:30 A. M. Fans and Dust Cyclone Design
American Blower Corp.
- 11:00 A. M. Methods for Collecting Fumes and Dust Samples
J. Gaskill, Mine Safety Appliances Co.
- 11:30 A. M. Business Meeting
Moderators: V. Sauchelli, H. L. Marshall
- 1:30 P. M. Controlling Caking in Granulated Fertilizers
Edmund P. Hudson, Scottish Agric. Industries, Aberdeen, Scotland
- 2:00 P. M. Aids in Selecting Types and Principles
 - a. Counter Current Drying of Drying Straight Tube
Smith-Douglass Co., Inc.
 - b. Concurrent Drying with a Dehydromat
D. Leister, Renneburg & Sons
 - c. Concurrent Drying Straight Tube
F. T. Nielsson, International Minerals & Chemical Corp.
- 3:30 P. M. Bags and Bagging — Panel Discussion
J. M. McDonald, Bemis Bros. Bag Co.
K. A. Arnold, St. Regis Paper Co.
W. Jacobi, Union Bag & Paper Corp.
O. W. McDuffie, International Paper Co.

Annual Meeting of Fertilizer Industry Round Table



Vincent Sauchelli
Chairman

CONTINUING in their 1956 meeting a discussion of fertilizer granulation, the Fertilizer Industry Round Table this year expands its program to include discussion on manufacturing control; bags and bagging; fertilizer equipment and design.

This sixth annual meeting will be held October 16-18 at the Shoreham Hotel, Washington, D. C. It will again be directed by Vincent Sauchelli, who organized the first meeting of fertilizer production men, and because of the response to this first session has continued the program each year. The session last year was attended by more than 200 industry men. Attendance this year is expected to be even greater. Dr. Sauchelli emphasized that the meeting is specifically designed for the plant production man.

A luncheon for the members will be given October 17th by the Potash Co. of America.

The first session, Tuesday afternoon (Oct. 16), will be moderated by Vincent Sauchelli, and will deal with sampling procedures and quality control. The following day, H. L. Marshall, of Olin Mathieson, will assist as moderator, and discussions will center on granulation, ammoniation and granulating equipment. The final day, J. E. Reynolds Davison Chemical Co., will join in moderator duties, at sessions centering on further discussion of fertilizer granulation, caking, bags and bagging.

SAFE

APPLICATION



Figure 1, Emulsion A

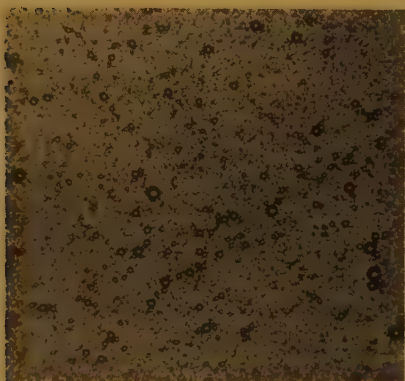


Figure 2, Emulsion B

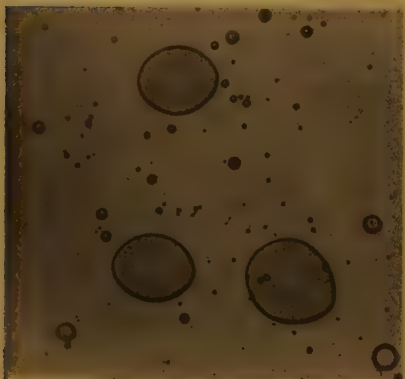


Figure 3, Emulsion C

PETROLEUM solvents are widely used in sprays applied to agricultural crops. When the solvent is formulated with such materials as DDT, a high level of solvent power is required. This degree of solvent power is found in the highly aromatic solvents. At high application levels, above those normally encountered in insecticidal formulations, these solvents are injurious to foliage. In fact, the uncompound oils may be used as herbicides.

The factors which enable the safe use of aromatic petroleum solvents in formulated sprays are low application rate and uniform distribution.

It is necessary to apply a minimum of about 60 gallons per acre of aromatic oil to effect good kill of vegetation in such areas as railroad rights-of-way. Recommended application rates of emulsion concentrates to agricultural crops seldom exceed three quarts per acre. This maximum application rate results in a deposit of only approximately one-half gallon per acre of the aromatic solvent. Even at this low application level growers sometimes observe an undue amount of burning of their crops. Experience has shown, however, that if the proper amount of solvent is distributed with any reasonable degree of uniformity, no burning of plant tissue need occur. Uniform distribution also minimizes any burning tendencies of insecticidal ingredients or emulsifiers.

Uniform distribution depends on suitable application equipment but to a larger extent upon proper emulsi-

fication. The purpose of this paper is to show the importance of properly emulsifying the concentrate to insure a minimum of leaf burning. The application of a coarse emulsion to foliage will result in areas having a relatively high concentration of oil, which may then cause burning.

In the extreme case, inadequate emulsification may result in separation in the spray rig. This can cause an undesirable preponderance of water or of concentrate to be sprayed out at any given time. This is particularly true where agitation is poor. However, in many cases the degree of improper emulsification is not pronounced, but the emulsion is sufficiently coarse to contain relatively large oil particles. These oil particles have a tendency to coalesce on localized areas of the leaf with resultant tendency to spot burning.

Adequate emulsification is not difficult. Many suitable proprietary emulsifiers are available. Emulsion quality is determined empirically to some extent, based on the experience of the compounder. However, more objective tests provide valuable additional information.

Two such tests which have been found suitable for laboratory evaluation of emulsion concentrates are given below. One of these is based on the physical appearance of the emulsion. The other is based on a biological test involving the application of the emulsion to growing plants. These tests have been developed utilizing field tested emulsion concentrates.

of Aromatic Petroleum Solvents in Agricultural Sprays

By

M. J. Janis

Socony Mobil Laboratories

Emulsified insecticide sprays containing aromatic petroleum solvents can be used for spraying crops without causing injury to the plants, providing the proper degree of emulsification is maintained. To determine if an emulsion is of satisfactory quality, a simple procedure is described in which the physical appearance of the film laid down by an emulsion is observed and classified. Another means of evaluating an emulsion, a test involving greenhouse-grown potted plants, is described. Photographs and photomicrographs provide illustrations.

Physical Appearance of Emulsion

TWO milliliters of the concentrate are mixed with 98 milliliters of tap water. One milliliter of the resulting emulsion is pipetted onto a standard one-inch by three-inch glass microscope slide, at room temperature. If within five minutes (as observed with the unaided eye), there is coalescing of the oil and formation of adjacent areas of essentially clear water, the emulsion is considered of unsatisfactory stability. Comparison of the test sample with a product that has proved to be satisfactory in field tests is desirable.

Biological Test

PREPARE 500 milliliters of an emulsion containing one-half percent of actual oil. Invert four-inch high greenhouse-grown potted young bean plants into the emulsion so that they are completely immersed. Hold the plants in a greenhouse for twenty-four hours at a temperature of approximately 85° F.; as much sunlight as possible during this period is desirable. Greenhouse plants are more susceptible to injury than those grown

out of doors. However, any appreciable burning effect is cause for rejection. The validity of this test can be increased by including a standard of known field performance.

Experimental Results

IN this work, the only variable studied was the emulsifier concentration. The type and amount of petroleum solvent and DDT was the same for all experiments. Also, the same emulsifier was used in all ex-

Figure 4

Oily film deposited by dried emulsion A



Figure 5

Oil droplets deposited by dried emulsion B

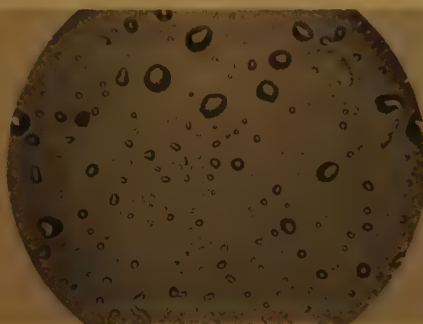


Figure 6

Oil droplets deposited by dried emulsion C



periments. The formulations used contained 70% (weight)

aromatic petroleum solvent
30% (weight) Technical DDT

Three different emulsifier concentrations were used so as to yield final emulsions of satisfactory, borderline, and poor quality. For simplicity, the following designations will be used to differentiate the three types of emulsions used.

Emulsion A—Satisfactory Dispersion

Emulsion B—Borderline Quality

Emulsion C—Coarse, Poor Quality

Figure 7

Bean Leaf, 4 days after treatment with emulsion A.

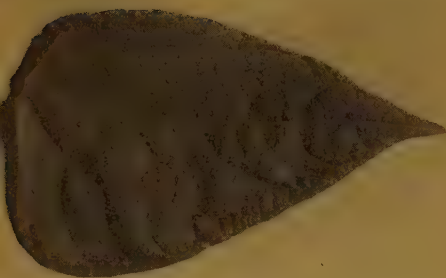


Figure 8

Bean Leaf, 4 days after treatment with emulsion B.



Figure 9

Bean Leaf, 4 days after treatment with emulsion C.



Figure 10

(1) Using Emulsion A. (2) Using Emulsion B. (3) Using Emulsion C.

Figures 1, 2 and 3 are photomicrographs of the three DDT Emulsions applied to glass slides. The emulsions were prepared and applied according to the method described earlier in this paper. The photomicrographs were taken immediately after preparation of the emulsions. Figure 1 shows that in Emulsion A the oil is uniformly dispersed. The particle size distribution is greater in Emulsion B, as seen in Figure 2. In Emulsion C, the oil is very poorly dispersed, as illustrated by the large globules in Figure 3. This latter emulsion may be expected to burn plant foliage. The magnification in these photographs is 100X.

Figures 4, 5 and 6 are photomicrographs (magnification, 20X) of the same emulsions which were taken after the emulsion had dried on the glass slides for 3 hours. Figure 4 is typical of an adequately emulsified preparation (Emulsion A). It shows a more or less continuous thin film of oil. Figures 5 and 6 show the type of deposition by Emulsions B and C, respectively. These two emulsions result in dried films where a marked coalescing of oil droplets is evident. Not only would the large globules of oil deposited by Emulsion C be expected to cause definite burning of foliage, but it is obvious that the insecticide would not be as uniformly distributed on the leaf surfaces as with Emulsion A.

Figures 7, 8 and 9 show the effect of the three emulsions on bean foliage. The leaves were removed

from the plants for photographing four days after dipping. The effect of emulsion quality on leaf burning is clearly shown in these illustrations. The satisfactory emulsion (Emulsion A) caused no noticeable injury to the plant tissues. As seen in the photographs, leaf spotting was noticeable, though not serious, with Emulsion B (Figure 8). The leaf treated with Emulsion C (Figure 9) shows that the extent of burning approaches serious proportions. This amount of leaf spotting throughout the plant can be expected to have a marked effect on its growth and productivity.

To illustrate the latter point, Figure 10, a photograph showing the plants treated with the three emulsions, is included. The photograph of the bean plants was taken one week following dipping in the emulsions. A careful examination of plants in pots No. 2 and No. 3 reveals leaf spotting and some general stunting which has resulted from the application of inadequately emulsified oil, whereas the plant and leaves in pot No. 1, dipped in properly emulsified oil, show no adverse effect from the treatment.

Characteristics of Aromatic Petroleum Solvents

AROMATIC petroleum solvents suitable for use in the preparation of agricultural emulsions show a comparatively wide range of characteristics. Typical properties of two such solvents which have been used

(Continued on Page 127)

what's available?—

and what's new? in—

Bagging Equipment?



FARMER demand for custom mixed fertilizers, granular fertilizers, fertilizer-pesticide mixtures, and particularly for fertilizer packed in a wider range of the smaller sizes of bags, has resulted over recent years in forcing a number of changes in bagging procedure in the fertilizer industry. Manufacturers of fertilizer bagging equipment have been alert to the changing needs of the industry and over the past few years have introduced a whole series of new and specialized types of fertilizer bagging and weighing equipment, modifying and improving earlier models.

Because some fertilizer buyers are specifying bag capacities of an order readily handled by their application equipment, the fertilizer manufacturer has had to install new bag filling equipment to meet such requirements. Where in previous years it was adequate to offer 100 or 200 lb. bags, now there is increased demand for the small, more readily handled bag sizes such as 80 lbs., 50 lbs. and even 25 lbs. units for some fertilizer users.

The following summaries by representative manufacturers of bagging equipment for the fertilizer industry review new models of bag filling and weighing machines now on the market, describing capacity, size of unit,

size of bags handled, room required for installation, speed, accuracy, power requirements, and special design features.

In the course of talking with a number of fertilizer manufacturers it was interesting to learn that a high percentage of the fertilizer sold in the midwest, Kentucky and Tennessee, is packaged in 80 lb. units. Alabama growers, on the other hand, seem to prefer the 50 lb. bag. There are a number of favorable comments on the small 50 lb. bag, but one fertilizer manufacturer points out that along with the advantages of this smaller package there are naturally disadvantages too. One is, of course, the added cost of supplying and handling more bags, which naturally results in a higher cost per unit of fertilizer used.

Comments below are those by the respective manufacturers of fertilizer bagging equipment and should provide a comparative picture for the fertilizer manufacturer of the varying designs and types of equipment which are available to him.

UNION Bag — Camp Paper Corp., New York, was one of the first companies to introduce an automatic bagging machine designed especially for use in the fertilizer industry. Union Bag introduced their first fertilizer bagger back in 1954, starting the trend toward more modern and high speed bag packing equipment in the fertilizer field. Some 300 of the machines, models UB 100-A and UB 101-A, have been installed in fertilizer plants all over the country. Speed and accuracy are important advantages claimed for the Union Bag equipment. Average production rates for 100# bags are from 18 to 20 bags per minute; the same for 80# bags; and for 50# bags from 20 to 23 bags per minute. With model UB 100-A tolerances of plus or minus 4 ounces are possible, while model UB 101-A allows for even closer tolerances, up to plus or minus two ounces per bag. In addition to speeding up production, it is claimed that Union's I & C Bagger, designed by Inglett & Corley of Augusta, Ga., allows the fertilizer manufacturer to cut down on the cost of his multiwall bags, since the I & C Bagger uses bags with open mouth construction rather than valve bags. This ability to use open mouth bags can result in savings up to seven or eight per cent in bag costs, the company indicates, and the open mouth bags are also better adapted to packing granulated, pelleted fertilizer than are valve bags.

I & C Bagger Model UB-101-A



"AF" Bagpacker

INTERNATIONAL Paper Company, New York, is in the process of introducing a brand new model of their 25 year old Bagpacker — the new Model "AF." It is a modification for specialized use of the much larger machine which has been in service for 25 years. Its installation cost is considerably lower than the Model "A" from which it is adapted, and it is said to be easier and faster to install. Although it has just been introduced on the market, it has already won wide recognition, and the first Model "AF" is now in process of installation. This first unit is being installed in the fertilizer industry.

The Model "AF" is highly adaptable for feed, fertilizer, salt and similar products. The machine handles bag sizes with a face width of 15 to 16 inches; length 30 to 36 inches, with a variation in gussets according to requirements. The machine operates steadily, filling up to 25 bags per minute, with the filling rate instantly adjustable by means of a variable speed drive. The rate can be maintained easily for an 8 hour day with only one operator. The only physical operation is the hanging of the bag on the filling spout.

The closure, which is an integral part of the machine, is the strongest available, a reinforced Cushion Stitch through selvaige tape and bag top, or through bag top without tape. Filling of the bag is described as uniform and completely accurate, and permits the utilization of minimum length bags for whatever product is being filled.

The Model "AF" Bagpacker is normally equipped with 3 or 4 Hoepner automatic net weighing scales, depending on the product being packed and the packaging rate required. However, with a more free flowing product, accuracy can be maintained with fewer scales. In any case, with due consideration for the product, the Model "AF" maintains accurate uniform weights in long or short run filling operations.

In spite of its rapid production rate, power required is small; a 2 hp. motor for the main turret drive, a 1 hp. motor for the settler drive (when used), and a ½ hp. sewing machine motor. Complete installation covers a floor area 9'2" x 12'3", with an overall height including scales of 16'9". Shipping weight is 10,800 lbs. (crated).

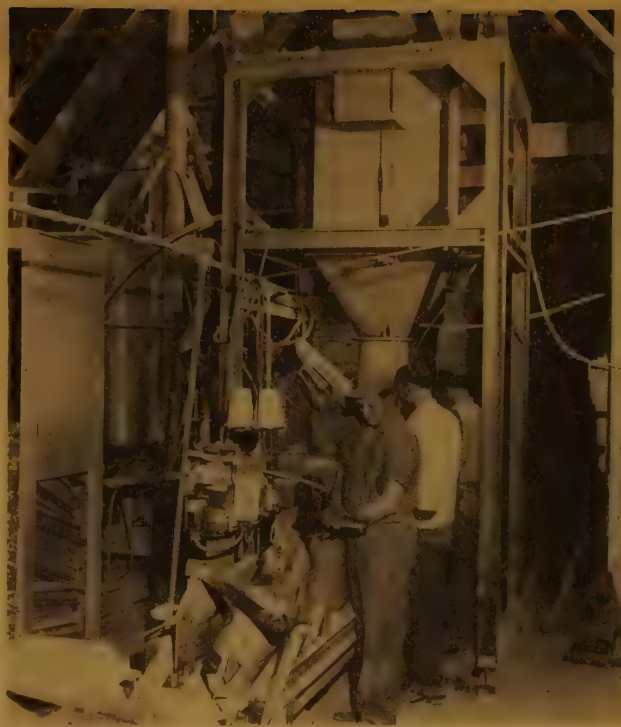
The Bagpak Division also manufactures closing and filling machines without the complications of scales and other devices, to satisfy packaging requirements for multi-wall packed products in a wide variety of fields.

THE Multiwall Packaging Division of St. Regis Paper Co. offers quite a series of fertilizer automatic bagging equipment. Their 135-AS model automatic bagging scale is a single-bucket device which delivers 95% of all weights within plus or minus five ounces at rates up to 20 bags per minute. The 135-AS model F is designed particularly for open mouth packing. It delivers the high rates needed during short shipping seasons. Production rates, dependent upon product density and flow characteristics, are as follows: 50-lb. and 80-lb. bags up to 20 per minute, 100-lb. bags up to 18 per minute and 200-lb. bags up to 12 per minute. A versatile machine, the single 100-lb. bucket handles 50, 80 and 100-lb. bags. A 200-lb. bucket and 10-in. spout are available for 200-lb. bags. Fast grade changes are possible due to the single-bucket design which means quick clean-out and minimum downtime for grade changes. The spouts are the quick-change type. A quick weight adjustment is provided by sliding the poise weight along poise arm.

The 160-FB valve bag filling machine is a high-production, two-tube unit which simultaneously weighs and fills multiwall paper valve bags by gravity. Standard equipment packs 50 lb., 80 lb. and 100 lb. bags, and optional equipment can readily be added to pack 25 lb. bag sizes. The filling tubes are close together, and the filling operation alternates from one tube to the other without interrupting feed either to the packer or to the bags. Output is determined by the rate of material flow to the packer. St. Regis advise that an output of 36 tons or more per hour has been attained with a straight run of a single grade of fertilizer, with 25 tons per hour a more normal average output.

Another St. Regis valve packer recommended for packing fertilizers is the 327-PB valve bag filler, a two-tube pre-weighing packer for multiwall paper valve bags. While one tube is filling, an empty bag is placed on the alternate tube. Production rate depends on characteristics of the material and skill of the operator, ranging from eight to ten 80 lb. bags or six to eight 100 lb. bags per minute. Additional parts are available for packing bag sizes from 25 to 50 lbs. A new feature on this packer is a reversible intermediate belt feeder which makes it possible to fill open mouth bags or valve bags from the same source of supply.

In addition to providing fertilizer packaging equipment, St. Regis has also developed a number of items to facilitate packing of fertilizers in bags.

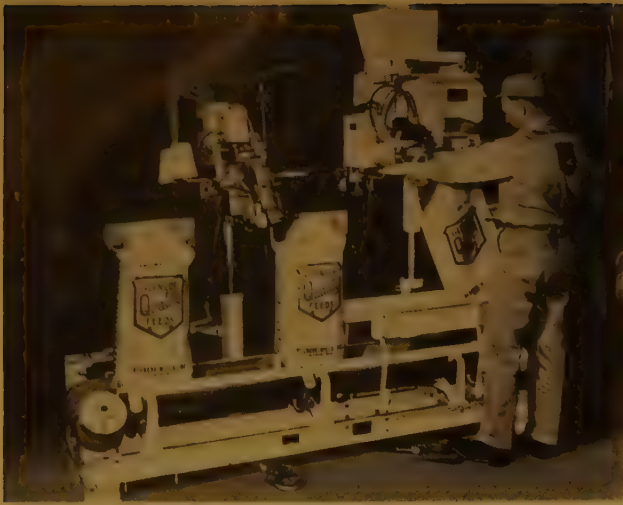


St. Regis Bagging Scale 135-AS Model F

BEMIS Bro. Bag Co., St. Louis, offer the Bemis Fertilizer Packer in two standard models — the series 6107 with power scale feed, and series 6108 with gravity scale feed. The 6107 units are three-bucket electro-mechanical scales designed specifically to handle fertilizer which has sluggish flow characteristics. Product is kept in constant motion, making it possible to feed with speed and at the same time accurately. The 6108 scales are also three-bucket electro-mechanical units designed specially to handle free flowing fertilizer. Either type scale will handle 50, 80 and 100 lb. multi-wall paper bags, or 100 or 200 lb. textile bags. Capacity is sixteen to eighteen bags per minute on any of the multi-wall sizes. Accuracy is ± 4 ozs. on the 80 and 100 lb. units, and ± 6 to 8 ozs. on the 200 lb. bags, depending on characteristics of the product being packed.

Bemis Fertilizer Packer at Smith-Douglass, Streater, Ill.





Bemis "Packerette"

Mechanical specifications are as follows:

Dimensions	Series 6107	Series 6108
Height	12' 8 $\frac{3}{4}$ "	10' 11"
Floor Space	10' x 41"	10' x 41"
Shipping Weight	5600 lbs.	4800 lbs.
Hopper Opening	9 $\frac{1}{4}$ " x 25"	14" x 32"
Floor to bottom of bag Holder Tube	51"	51"
Power Requirements		
110 volts, 60 cycles	2.5 kva	.6 kva
220/440 volts 3 phase, 60 cycles	.8 kva	.8 kva
Motors		
110 volts, 60 cycles, single phase-1/12 H.P.		1/12 H.P.
220/440 volts, 3 phase, 60 cycles (2) $\frac{1}{2}$ H.P.		(2) $\frac{1}{2}$ H.P.
Air Requirements		
60 lb. pressure	107 cu. ft. of free air per cycle.	

THE "Kraftpacker," an automatic open mouth filling machine, is designed primarily for fertilizer plants. This equipment is capable of packing any free flowing materials in the 25-200 range, and can be installed in practically any plant with a minimum of modification. Kraft Bag Corporation, New York, is the exclusive sales agent for this packer and the standard model is sold at \$2,250.00 f.o.b. Montgomery, Ala.

In addition to the standard model, which is of sturdy sheet steel construction, Kraft Bag also has available models of stainless steel construction at a slightly higher cost. It also modifies packers to handle specific materials such as ammonium nitrate.

Electricity is utilized in the "Kraftpacker" operation with current characteristics predicated on the power avail-

able in the user's plant. The scale and gates are activated by means of micro switches and dust-proofed solenoids. No air is necessary to the operation and the simplicity of the packer assures easy maintenance.

The employment of a continually moving feed conveyor, and a surge hopper cut-off assures weights close to plus or minus 4 ounces, — Kraft Bag guarantees plus or minus 8 ounce variance. No head of material is necessary to maintain accuracy, and thus correct end weights are assured and analyses changeovers may be made with a minimum of time and effort. The machine is capable of operating at high speeds and will drop up to 30 charges per minute. Users have reported bagging up to 23 one hundred lb. bags per minute, with a daily average of 18 bags per minute. Actually, the only limitation on the number of bags per minute possible is the human limitation. Operators capable of hanging 23 bags per minute are not common.

Installation of the "Kraftpacker" can be made in a minimum amount of space. The packer requires a maximum of 9'8" headspace with an overall ceiling height of approximately 11'6" including space for the customer's sewing machine conveyor. Only 12 sq. feet or a 3 x 4 floor area is required. The "Kraftpacker" is shipped ready to install, and complete installation can be accomplished in a few hours.

Kraft Bag Corporation reports that they have replaced manual scales, automatic open mouth scales, and automatic valve scales with the "Kraftpacker." In almost every case, the user has reported increased satisfaction, easier handling, decreased costs, and increased production.

The Kraftpacker





THE Thayer bagging unit is available as Model 1000N single unit or 1000N2 duplex unit. The speed of operation on 80 or 100 lb. bags is 10 to 14 per minute on the single unit, and 20 to 24 per minutes on the duplex. Accuracy at these rates is within 2 ounces. The unit is designed to handle either granular, pelleted or commercially mixed fertilizer through the use of a combination bulk and dribble belt feeder.

The Southland Packer

THE "Southland Packer," distributed exclusively by the Chase Bag Company, Chicago, is manufactured by Chattanooga Boiler & Tank Company, one of the oldest metal fabrication specialists in the industry. It is completely automatic, all-electric, the latest improved equipment for packing fertilizer in open mouth textile and multiwall paper bags.

Fast handling of 70, 80 and 100-lb. multiwall paper bags is assured, with 25 bags per minute a typical working speed. Even 200-lb. burlaps pack rapidly and easily.

Southland Fertilizer Packer



Sustained high accuracy of weights over an extended run is guaranteed.

Minimum change-over time from one analysis to another is an outstanding feature of the new "Southland." Cylindrical hoppers and buckets allow a clean and complete flow of material. Simplicity of design reduces maintenance costs and problems. Parts are standardized, can easily be interchanged in plants where more

(Contd. on P. 123)

Compensation for these factors is accomplished partly by the belt feeder, and partly by the Thayer automatic remote anticipator adjustment-by means of which the operator can readily retain high speed and accuracy of the scale regardless of the change in flow characteristics and bulk density of the product handled.

This unit also incorporates an air piston operated weigh hopper which assures no run-throughs of product, complete cabinet enclosure for dust tight operation and, the exclusive flexure plate linkage.

The Thayer flexure plate construction features a frictionless design. The unit does not suffer from inaccuracy due to corrosion, dirt or dust as conventional pivot and knife edge scales will.

A complete control cabinet is provided with each of these scales, incorporating such valuable features as checkweigh indicating lights and remote weight adjusting dials. The Thayer Scale requires very little head room for installations, occupying no more than 6 ft. from input of product to the top of bag on the single unit and no more than 7½ ft. of head room on the duplex from the input of product to the top of bag.

RICHARDSON Scale Co., Clifton, N. J., is just introducing a new fertilizer bagging scale—Model HA39—which will handle up to twenty 80-lb. bags of fertilizer a minute, with a filling accuracy of $\pm$ four ounces. All contact parts and parts exposed to fertilizer dust are of stainless steel, and the unit features such construction details as power driven belt feeder within the scale, air cylinder discharge of hopper and totally enclosed dust-tight construction. It weighs approximately 3,000 lbs. Framework of scale is of 10 gauge plate, and the weigh-hopper is 3/16" plate (mild steel) or 12 gauge plate if made in stainless. All electrical control equipment is 110

(Continued on Page 123)

Richardson Bagging Scale — Model HA39



Pesticide Industry

by J. V. Vernon

President, Niagara Chemical Division,
Food Machinery and Chemical Corp.
Middleport, N. Y.



Outlook*

THE members of the Pesticide Industry are engaged in an essential business. Reams of figures have been published which show in detail the millions of dollars' damage caused annually by the various pests. Figures are also available on the value of products used for the control of these pests. It is also well recognized that without the judicious use of our general line of pesticides we would be unable to grow enough food and fiber crops to feed and clothe our own people, to say nothing of our products which we supply to friendly nations throughout the world.

We therefore have assumed a direct responsibility for providing sufficient of our products to adequately protect our nation's agriculture. The people engaged in agriculture are willing to pay a just price for our products and do not expect us to be their benefactors. The members of this Industry have seen to it that adequate supplies of their products have been available, and to my knowledge no emergency has arisen which has not been met. We are woefully weak, however, in one respect — that is adequate statistical information.

I would like to digress just a moment to pay tribute to Dr. Shepard and his group in the U. S. Department of Agriculture for the fine statistical job they have done from the meager information available to them. To do our overall job better we simply must have more complete

information, and I should like to recommend that a task committee be appointed by the Association to work with Dr. Shepard and his group to see if a simple method of securing statistical information can be worked out. I feel sure that, with better information, our Industry can better serve our nation's agriculture.

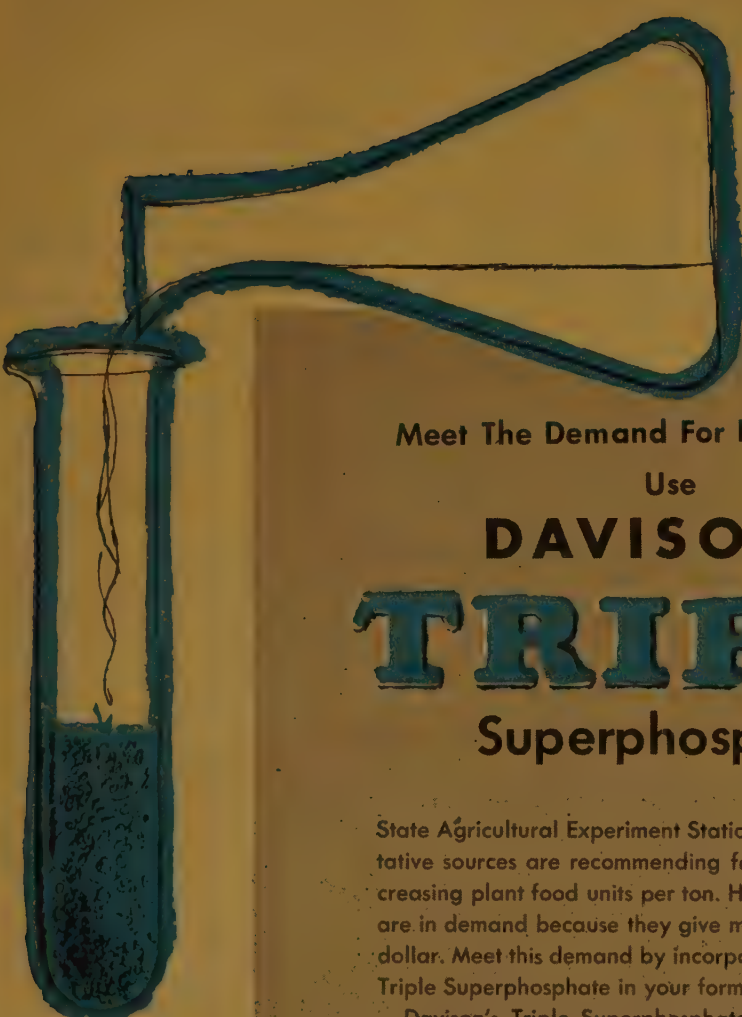
Much has been said about research and development in our Industry. You must have been impressed by the talk given at our Spring meeting in Miami by Mr. J. A. Field on the amount of research money it takes to develop a product. Maybe the figures he talked about seemed so unreal that some just do not grasp the significance of research dollar recovery. Statistics have been published that indicate all Industry in the United States will spend 5.5 billion dollars in research and development in 1956, and in 1959 the sum will be 6.3 billion dollars. Several millions are being expended annually by the members of our Industry. Those research dollars must be recovered through the price we charge for our products, or one of two things will happen — you either go broke, or you quit spending. I feel certain that no one in our Industry expects to see a drastic curtailment in this phase, whether he be a basic producer, a local formulator, or a user of finished goods. The research dollar wisely recovered is our insurance for the future.

It takes a lot of money to run a business in this Industry. The capital investment required for goods and

services is probably higher than in any other type of business. Inventories must be built up in advance of the actual use season, which requires heavy use of capital. If you have been wise in what you make in advance, and if infestations occur, and if the styles don't change, you probably will liquidate most of the inventory. Guess wrong a few times though and your principals will be screaming. Therefore, inventories plus accounts receivable represent a heavy drain on cash reserves which must be reckoned with in the cost of doing business. These factors, plus normal costs of management overhead, plant supervision overhead, sales and advertising expense, research and development expense, technical service to sales, credit and collection expense, plus the cost of raw materials, labor, packaging, and distribution costs make up a tidy sum when related to a product. If there is anything left when the goods are sold, it is generally referred to as Profit before Tax. Then there is a 52-48 split, usually, and the residue, if any, provides a little something for the forgotten man, the stockholder.

I simply mention these things as a prelude to the subject assigned because the *outlook* for our Industry is closely related to the *health* of the Industry. I feel sure you will agree that conditions in our Industry must be improved if we are to carry out our responsibility to agriculture and the people of our land to provide adequate food and fiber. The outlook may be classed as being in a state of confusion and cloudy. However, let's

*Before the Annual Meeting of the National Agricultural Chemicals Association, Spring Lake, N. J., September 7, 1956.



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take a look into the future for a brief moment. I believe the opportunities that lie ahead are limitless provided we conduct our affairs in the spirit of integrity, resourcefulness, and comprehension.

Let's take a look at just a few things we can and should do —

1. Improve our existing products so that better performance in field use may be attained.

2. Improve our technique of use. This should be done in cooperation with Federal and State Experiment Stations so that maximum benefits can be obtained from the use of our products by the farmers who apply them to their crops.

The potential development for the goods of our Industry lies along the new frontiers of uses, such as:

Continued effort and cooperation in the world-wide problem of stamping out malaria through adequate pest control. This is one of the most important world-wide projects that can save untold suffering and countless lives. We should urge the continuation of this work.

Another area for development is in the control of destructive soil insects. Improved production and quality of produce grown can be achieved by a better control program in this broad area. Much work needs to be done here to determine the practical aspects of the problem.

The use of pesticides and herbicides on highway rights of way. As we get further into the road building program, this area will offer great opportunities for developing new business in our field.

As available labor becomes less and less on our farms, the use of chemicals becomes more important; for example, the improved understanding and use of selective herbicides in growing crops to take the place of hand labor, such as pre-emergence treatments to control weeds and grasses.

Still another area of great promise for the use of our products is the adequate protection of our huge supply of stored grains. There isn't much use to pile up a surplus of grains if

(Continued on Page 125)



Entomology Research in

THE total research budget for the Entomology Research Branch in the current fiscal year is slightly under 5 million dollars. The program can be divided into a number of broad but rather distinct areas of research. It might be of interest to list major areas of research with an estimate of the total effort devoted to each.

Research Area	% of Total Effort
Chemical control	69
Biological control	8
Biology, ecology, etc.	7
Insect classification and identification	6
Insect resistance in plants	4
Insect pollination and bee management	4
Cultural and other control methods	2

Chemical Control

OVER two-thirds of our total research effort is devoted directly or indirectly to chemical control of insects. Much of this research is conducted in cooperation with state experiment stations, industry, and other research agencies.

Chemicals generally provide the most successful means of insect control. Hundreds of destructive pests are readily controlled with chemicals. Some of our leading crops, such as cotton, most vegetables, many fruits, and certain forage crops, could not be produced profitably without the various insect control chemicals that

are now available to the grower. Other important crops and livestock would suffer severe damage, particularly in insect outbreak years, if it were not for the use of insecticides. Therefore, the total research investment of the Federal and State agencies and industry, all of which have cooperated, has yielded high returns to the grower and to the nation's economy which fully justify the effort.

Research on chemical control conducted in the Entomology Research Branch may be classified into several rather well-defined areas. Laboratory evaluation of promising chemicals and subsequent field testing of those that appear practical require most of our efforts. The screening of insecticides represents a relatively small part of this program. Industry has assumed leadership for the synthesis and screening of candidate chemicals, and we feel that they should continue to do so. However, in order to be able to explore the possibilities of certain kinds of chemicals, we find it necessary to do some synthesis work and to do some screening. For example, in our endeavor to find more effective repellents to protect military personnel from vectors of arthropod-diseases, our Pesticide Chemicals Research Section has synthesized a large number of repellents which have been screened at the Insects Affecting Man and Animals laboratory at Orlando, Florida. This screening program, based on chemical relationships to known promising compounds that were obtained from industry and other sources dur-

*Presented at the Annual Meeting of the National Agricultural Chemicals Association, Spring Lake, N. J., Sept. 5, 1956.

the USDA

by E. F. Knipling*

Entomology Research Branch
U. S. Department of Agriculture

ing World War II, has led to the development of a highly effective repellent, diethyltoluamide, which is of considerable interest to the military agencies.

Another example of the urgency of basic chemical work and screening of compounds is our current program on insect attractants. Industrial concerns are not including attractants in their current research programs. The remarkable attraction of male oriental fruit flies to methyl eugenol is well known. This attractant, which was developed by our Fruit Insects laboratory in Hawaii, will be invaluable as a survey tool in areas of new infestations, and it might even prove effective in the control or eradication of the insect. The discovery of this substance highly attractive to males of the oriental fruit fly stimulated research on specific attractants for other important fruit flies. Only recently the Hawaii laboratory found angelica seed oil to be a powerful specific attractant for the male Mediterranean fruit fly. Thus we now have a valuable survey tool in the current program for the eradication of this fly. Similar investigations have led to the discovery of anisyl acetone, an attractant superior to any previous one for the melon fly.

By and large, however, we depend on industrial companies to supply us with promising insecticides for further development. We prefer to

obtain materials that have been shown to possess some insecticidal activity. We are prepared to accept such materials for further laboratory evaluation against various pests and for field testing if results justify it. The Branch has recently initiated a program to obtain better coordination of insecticide testing in our laboratories. In the past, companies have dealt directly with the field stations and Sections. They are at liberty to continue this procedure if they prefer, but we are in the process of setting up a centralized contact unit where arrangements can be made for the preliminary testing of candidate materials on select insects at various laboratories. The Branch has about 115 field stations located throughout the United States and some foreign countries. Investigations are under way on several hundred insect pests. About 100 of these species are maintained as colonies or can be obtained in adequate quantities for conducting laboratory tests. Our plan is to have a promising compound received from industry or other sources tested in the laboratory against 10 to 25 economic species. If these tests indicate broad insecticidal activity, the compound will be tested against additional species. Results of such tests in comparison with suitable standards against 25 to 50 or more economic species should serve as a guide for our laboratories and the submitting agency to determine whether field

tests, residue studies, toxicological investigations, and other research are warranted.

The field testing of proved insecticides against specific pests to determine their biological effectiveness and suitable dosage rates, formulations, and schedules of treatment requires most of our effort on chemical control. The nature and scope of this program are well known, since much of the testing is done in close cooperation with manufacturers and formulators.

In our research on insect control with chemicals we are soon faced with the problem of residues. Residues have long been important in connection with insecticide use. However, during the short span of ten years it has been necessary to conduct residue studies on dozens of entirely new chemicals and formulations, at various rates of application, on a wide range of raw agricultural products. Without doubt this has become one of the most complex problems ever encountered in the entomological field. Yet, in spite of its magnitude and complexity, good progress has been made. Many new chemical control measures have been put into use which have saved growers billions of dollars. To my knowledge no case of poisoning in man has resulted from insecticide residues on raw agricultural products.

The Entomology Research Branch currently is spending close to \$500,000 annually on various aspects of the residue problem. Most of this support has required shifting emphasis from other lines of research. The Pesticide Chemicals Research Section has a group at Beltsville, Maryland, working on various residue problems. The Beltsville laboratory also coordinates similar studies at five field locations. The laboratory at Moorestown, New Jersey, devotes primary effort to soil residues; at Tifton, Georgia, we are emphasizing basic studies on the disappearance of residues on forage crops; at Yakima, Washington, and Vincennes, Indiana, we are investigating residues on fruits, vegetables, and forage crops; and the Kerrville, Texas, laboratory



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is conducting residue studies in meat and milk. The Kerrville work is closely coordinated with toxicological studies on insecticides carried out under the leadership of veterinary toxicologists of the Department of Agriculture's Animal Diseases and Parasite Research Branch.

Much of the work on residues has been carried out in close cooperation with industry. This is particularly true of the studies at Kerrville. During the last ten years at least 15 cooperative projects on residues and on the toxicity of insecticides to livestock have been carried out under formal agreements.

The increasing number of insects that have become resistant to insecticides is another major obstacle in the insecticide use field. This problem has kept much of our research on an emergency basis, so that it has not been possible to activate long-range programs. We have been criticized for not giving enough attention to basic research in entomology. We recognize the need for such investigations. But it is not easy to make major shifts from urgent applied problems to long-range basic research when the dairymen and general public are demanding relief from flies, when our cotton industry is threatened because of insecticide-resistant boll weevils, when the health of our troops is jeopardized because DDT no longer controls the loose vectors of typhus, and when fruit growers are in need of a safe substitute for controlling DDT-resistant codling moths. Add to such problems a new highly destructive forage pest such as the spotted alfalfa aphid and the Mexican and Mediterranean fruit flies which are threatening the fruit industry in this country. These and other lesser but no less urgent problems that have arisen during the past five years have necessitated applying all available research resources to find immediate solutions.

Biological Control

THE use of parasites and predators has for many years been one of the first considerations in searching for methods of controlling new pests introduced from foreign coun-

tries. A recent outstanding example of the value of parasites is the successful control of the citrus black fly in Mexico. After establishment of this insect, the introduction of several species of parasites through cooperative effort of our government and the Mexican government has provided commercial control of the pest in Mexico, and at the same time alleviated greatly the threat to our own citrus industry. The Branch maintains two foreign laboratories, one in France and the other in India, in a continuing search for natural enemies that might be useful to control destructive insects in this country. A third foreign station has been established in the Middle East to search for insects and diseases that might destroy undesirable plants in this country.

We know that many insects are of little economic importance because of natural enemies. There are extremists who believe that most insect problems will be solved if we let nature take its course. It is apparent that under modern farming practices, nature's balance between certain destructive insects and their parasites permits too much damage to meet standards of production efficiency. Therefore, we cannot depend on nature to solve our insect problems. But neither can we afford to ignore biological control. We encounter more and more instances where the use of insecticides has wiped out certain natural agents with the result that pests of secondary importance have become primary pests.

Very little research is currently under way on this problem. I know of no study that can become more involved than one designed to establish for a given crop the many relationships that exist between a destructive insect complex and its natural enemies, and then to determine the effect of insecticide treatments on such relationships. Yet this is a problem that must be solved for many insect species if we are to utilize insecticides with maximum efficiency.

In addition to parasites and predators, bacteria, viruses, fungi, and other organisms exert great influence

in depressing insect populations. Often expected outbreaks do not materialize because of disease epizootics. A study of insect pathogens as a means of insect control is becoming an important aspect of entomology research. California has devoted considerable effort in this direction during recent years. Canadian workers are giving much attention to such research.

Our Branch for many years conducted limited research which led to the use of milky disease for Japanese beetle control. Recently a small but highly capable unit has been established in the Branch to study insect diseases. The distribution of insect pathogens in somewhat the same way that insecticides are applied may eventually be a means of controlling a number of destructive insects. Many disease organisms that are known to be highly virulent against their insect hosts are so specific in their action that there is little likelihood that they will prove harmful to man, animals, plants, or beneficial insect species.

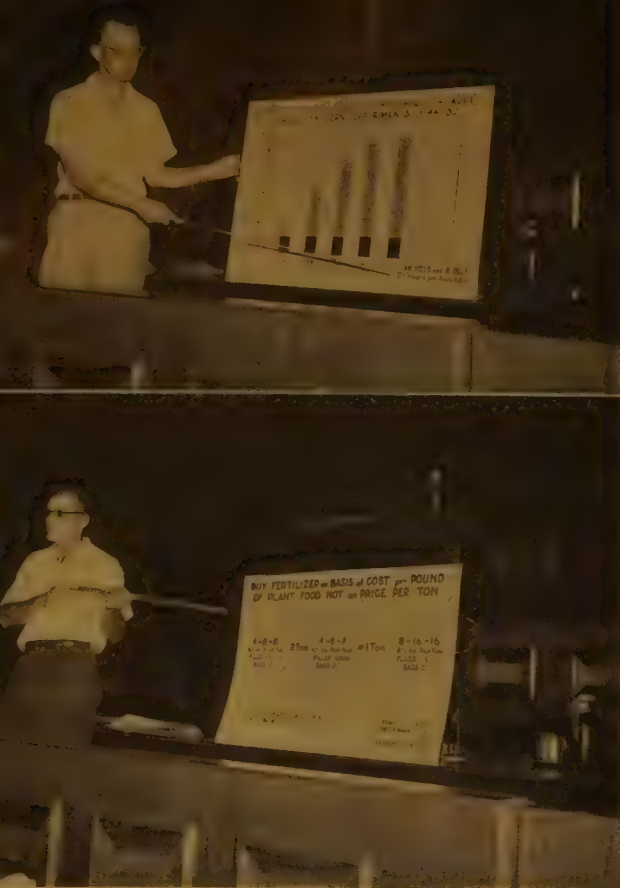
A number of promising insect pathogens are now under study in our Branch. A nematode originally found attacking codling moth larvae carries with it a highly virulent bacterial organism that is effective in killing a wide range of insect pests. Viruses show promise against such insects as the pine sawfly larvae, the cabbage looper, the corn earworm, and the tent caterpillar. A number of fungus diseases of aphids, including the spotted alfalfa aphid, are under investigations. However, the science of insect pathology is still in its infancy, and much is unknown about insect diseases, how to culture them, and how they can be used effectively for insect control.

(Part 2 in November

AGRICULTURAL CHEMICALS)

THE VALUE OF A COMBINED INSECTICIDAL AND CULTURAL PROGRAM FOR CONTROL INSECTS IN THE ALAGUNA OF MEXICO, by C. S. Rude. This is a four-page booklet discussing chiefly the pink bollworm, which it says far surpassed in damage the boll weevil, bollworm, and conchuela. The report indicates that a 2-10-40 mixture was most effective for control. ARS-33-29, August 1956. Agricultural Research Service, USDA, Washington.

Georgia Holds 40 Meetings to Educate Farmers and Dealers



Top Photo: Ralph L. Wehunt discusses cost-yield data.

Bottom Photo: P. J. Bergeaux continues discussion of fertilizer cost based on pound of plant food.

A UNIQUE summer fertilizer education program was just completed in Georgia that gives evidence of having been a wide-spread success throughout the state. The program, prepared by the Georgia Agricultural Extension Service in cooperation with the Georgia Plant Food Educational Society, was presented at 40 meetings throughout Georgia during July-September, to which fertilizer dealers, salesmen, farmers, county agents, vocational agriculture teachers, and others interested in fertilizers were invited.

The meetings were conducted by Dr. Ralph L. Wehunt, soils and fertilizer specialist, and P. J. Bergeaux, fertilizer specialist, both of the Georgia Extension staff. Detailed visual aids supported the presentation of factual, basic fertilizer information. In form, the program consisted of two hours' discussion, followed by a question and answer session. Attendance at the meetings is reported to have been very high, and Georgia extension officials are highly optimistic about the long-range effect of the sessions.

Each meeting consisted of a general introduction by the local county agent, followed by brief talks by Dr. Wehunt and Mr. Bergeaux.

Dr. Wehunt led off each session discussing the question "Do Fertilizer Education and Services Pay?" He pointed out that fertilizer prices have advanced only 13% since 1935, while the prices of all other items farmers buy have advanced 125% in the same period. "This means that fertilizer, correctly used, is a better buy today than ever before," he said. "Past records have proved that a dollar invested in fertilizer will return to the farmer from three up to seven dollars, or more."

He outlined methods which county agents and fertilizer dealers can use to assist both their farmer-customers and each other, to "promote soil testing, and encourage farmers to follow recommendations based on soil tests." He suggested also a greater distribution of agricultural college publications on the proper use of lime and fertilizers, and the maintenance of a bulletin rack or information center containing the latest

up-to-date literature. "This will help the dealer become more aware of the services that farmers need and like. He will learn and be more capable of acquainting farmers with the whys, whens, and hows with regard to plant food."

"Lime,—A Problem in Soil Fertility" was the title of a second address on the program, also presented by Dr. Wehunt. "Results of tests on samples received by the Georgia Soil Testing Service show that a high percentage of soils in Georgia are acid and need lime," he declared. "The greatest percentage of acid soils occurs in the lower Coastal Plain area." He described how the percentage of soil testing below pH 5.5 in that region had increased by 14% from the period 1945-51 to 1954-55.

"According to the National Limestone Institute, Georgia farmers in 1952-53 used 307,084 tons of lime. It is estimated that approximately 2 million tons should have been used to correct acid soils and to increase crop yields." He urged use of the finer grades of limestone, which he said are more rapidly effective; on the other hand he pointed out that coarser lime remains in the soil for a longer period.

Dr. Wehunt went on to describe in detail exactly how and when to lime. "The best guide on how often to lime is a soil test made every two or three years. Coarse textured (sandy loams and sands) soils require less lime per application but more frequent additions to maintain a desirable reaction than fine textured (clay loam) soils.

"Mixed fertilizer cannot be utilized efficiently if the soil needs lime," he pointed out. "If profitable returns are to be realized from fertilizers, soil acidity must be corrected." The agronomist showed a number of graphs and charts illustrating percentage of soil samples falling into certain pH reaction ranges, relative neutralizing values of some common liming materials, a comparison of various grades of limestone when applied at the same rates, and various other detailed comparisons on the use of lime in the various sections of Georgia and on individual crops.

Mixed Fertilizers

P. J. Bergeaux described "What's in Mixed Fertilizers," in an attempt to answer the recurring question "Why doesn't a 100-pound bag of fertilizer contain 100 pounds of plant food?" He stressed strongly the importance of each element's role in a mixed fertilizer.

"Next to nitrogen, phosphate is probably the most limiting element in our Georgia soils. According to a summary of soil test data for Georgia, 51% of the soils are low in phosphate, with North Georgia soils generally lower in phosphate than South Georgia soils."

Mr. Bergeaux also stressed the importance of soil testing. "In many cases where the soil phosphate is really low, a recommendation of so many pounds of a complete fertilizer is not sufficient to take care of the necessary phosphate for the crop to be grown. In this case, an additional amount as superphosphate or triple superphosphate may be necessary to bring up the phosphate level in the soil to where a successful crop can be grown."

On the lack of potash, Mr. Bergeaux reported that 70% of South Georgia and 41% of North Georgia soils had been found to be low in this element. He pointed out that, unlike nitrate nitrogen, potash is not leached out of soil, and a potash reserve can be built up by heavy applications of potash fertilizers. "Potash behaves as a catalyst, and is credited with increasing vigor and health, stiff-

ening stalks, improving the quality of plants, helping young roots to form and grow, and contributing to the plant's manufacture of sugars and starch."

The agronomist also outlined the functions of the secondary elements, calcium, sulfur, and magnesium; and of the trace elements, copper, manganese, boron, zinc, iron, and molybdenum. He urged farmers to:

1. Buy the fertilizer grades recommended by the College of Agriculture, as those grades will usually supply plant foods at the lowest cost per unit or pound, as well as conform to the latest information on the best plant food ratios for the particular soil and crop conditions involved.

2. Buy fertilizer on the basis of cost per unit or cost per pound of plant food rather than on the cost per ton alone.

3. Buy fertilizer with as high a total percentage of plant food as possible under local conditions. A 4-12-12 grade is a better buy than a 4-8-6 per pound of plant food.

Following a ten-minute recess, Dr. Wehunt then gave a 15 minute presentation on "Nitrogen-The Key to Maximum Crop Productivity," declaring, "How fast crops grow depends more on nitrogen than upon any other nutrient . . . without nitrogen there would be no stalks."

"Georgia farmers are not using sufficient nitrogen for their crops for the most profitable levels of production," he asserted, pointing to the extremely low level of nitrogen as a chief factor in the low average corn yield per acre in the state. Outlining various cautions to use in the application of nitrogen, he traced the apparent causes of leaching of the various nitrogen nutrients.

Again he stressed the need for adequate liming. "The tendency of ammonia forms of nitrogen to make the soil more acid, and the effect of nitrogen carriers that make the soil less acid can be ignored as having too slight an influence on an adequate liming program. "In comparing the loss of lime by crop removal, leaching, and erosion, the reduction in lime

content of the soils by acid fertilizer is found to be very small. Regardless of the source of nitrogen employed, a sound liming program must be followed to insure good crop yields."

Using nitrogen price figures in Athens, Ga. as being fairly representative, he furnished his audience with an easy method of computing costs per acre. "By purchasing ammonium nitrate," he said, "the farmer can obtain the nitrogen he needs for less money. Such savings, projected to a state-wide basis on all crops, would amount to many millions of dollars.

"If applied correctly, anhydrous ammonia and liquid nitrogen are food sources of nitrogen as top and side dressings. When the cost-per-pound of nitrogen from these sources is cheaper than ammonium nitrate, the farmer should consider using them. These materials require special equipment for application, which must be added to their cost. If these materials are applied by custom applicators, this charge should be added to the cost-per-pound of nitrogen."

Mr. Bergeaux also talked at each session on the topic, "More Profit From Efficient Use of Fertilizer."

"According to a county agent survey in 1955, 192,000 tons of fertilizer and 65,000 tons of 17% nitrogen side dressing was used on 890,000 acres of cotton; 441,000 tons of fertilizer and 187,000 tons of 20% nitrogen side dressing used on 2,795,000 acres of corn and 250,000 tons of fertilizer and 95,000 tons of a 23% nitrogen top dressing used on 1,226,000 acres of temporary and permanent pastures.

"It is apparent from the figures above that the greatest potential in expanded fertilizer use is on pastures and corn.

"Had the approved fertilizer recommendations been carried out in 1955 on cotton, corn and pastures, an additional 1,258,062 tons of fertilizer and nitrogen materials would have been used which is just about double the amount that was actually used. By following the fertilizer recommendations and other approved cultural practices, farm income can be increased by over \$200,000,000."

Pressurized Plant Sprays

AN article in the October issue of **AEROSOL AGE**, a monthly magazine published by Aerosol Publications, Box 31, Caldwell, N.J., by John F. Odeneal of the Fairfield Chemical Div. of Food Machinery & Chemical Corp., Baltimore, reviews "The Development of Pressurized Plant Sprays." Mr. Odeneal indicates that, contrary to the opinion of insecticide experts as expressed when work on pressurized garden plant sprays was started back in 1950, each year has shown a steadily increasing demand for aerosol bombs for home garden use.

He recalls that such products were looked on with but little enthusiasm in the early days of their development and were criticized as impractical and uneconomical for garden use. There were obvious problems in connection with use of pressurized sprays outdoors because of wind and the failure of aerosol pesticides to offer any residual protection.

The first experimental bombs, Mr. Odeneal recalls, killed plants within twenty-four hours with the kerosene-type oil which was used in them, coating the leaves and preventing the plants from breathing. Finally, the discovery of new solvents and the gradual elimination of kerosene-type oil led to the development of safer sprays, and eventually a garden bomb unit was developed that contained only one part of oil in one thousand parts of spray.

These aerosol units are now

widely used for the control of pests on such ornamental as roses, azaleas, asters, begonias, mums, zinnias, african violets, and many other plants, and can also be used in the vegetable garden on tomatoes, cucumbers, corn, peppers, etc. Aerosol insecticides carry such a high concentration of active ingredients compared to most water-based garden sprays that such insects as Japanese beetles, thrips, aphids, mealy bugs, red spiders, lace bugs and other common garden insects are readily controlled.

The development and popularization of the pressurized garden sprays has opened up a new market for pesticides in this field, Mr. Odeneal states. Previously there has always been a rather elaborate series of preliminary preparations to be made by any gardener large or small just to control a very minor infestation. As a result, many small gardeners had never bothered with spraying their plants or vegetable gardens, because they found the necessary mixing and equipment too much trouble, too expensive or too time-consuming. Now with the push button unit, even large gardens can be spot-treated and by keeping incipient infestations under control, major spraying jobs can be avoided or at least postponed.

A big advantage of the aerosol pesticide for home garden use is that it satisfies the gardener's desire to see the pests actually drop when sprayed. Most of the present plant sprays are formulated with combinations of pyrethrins, piperonyl butoxide, piper-

onyl cyclonene, and rotenone. These toxicants, of course, assure fast knock-down and kill, and have the advantage of being exceptionally safe for use around the home and garden. A further advantage which is becoming more and more important is that they continue to kill those insects which have been developing resistance to some of the chlorinated insecticides. One of the possible drawbacks is that there seems to be a tendency among users to "over spray." This is not only uneconomical but also may cause plant injury.

Mr. Odeneal notes that following the successful development of the first of these pressurized insecticides for home garden use, a number of variations of the original product have been developed and marketed. Some units now contain fungicides as well as insecticides. The first formula of this type was designed to control black spot on roses. This year, products are being marketed containing combinations of fungicides designed to control not only black spot but also powdery mildew and a wide spectrum of additional plant diseases.

Other possibilities include the addition of a growth stimulant, a blossom-set compound, or a leaf-shine. With many of these new products showing considerable promise, Mr. Odeneal suggests that it is possible to look forward to a wide variation on the original basic formulas within the next year or two, and a continually expanding market for the sale of such products.★★



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TEN thousand chemists, chemical engineers, and industry representatives gathered Sept. 16-21 at Atlantic City for the 130th national meeting of the American Chemical Society. The vast list of speakers on a variety of chemical industry subjects, included a large representation from the agricultural chemicals field.

On Sept. 18 the Division of Chemical Marketing and Economics devoted its entire session to a symposium on "Chemicals in Food Production." Leading industry representatives reported on the current and future role of fertilizers, and developments in the pesticide industry.

C. Y. Thomas, of the Spencer Chemical Co., Kansas City, sounded a note of warning on the rapidly expanding nitrogen producing facilities in the U. S., calling "the race to construct ammonia production facilities . . . a serious breach of one of the fundamentals of our economic society."

"No part of the fertilizer industry has experienced such spectacular growth as the nitrogen industry since the beginning of World War II," he declared. "In December 1941 there were eight synthetic ammonia plants operating in this country, with an estimated annual capacity of 470,000 tons of anhydrous ammonia . . . There are presently operating in this country, 45 synthetic ammonia works with an annual capacity of 4,236,000 short tons of ammonia."

"The pressures of oversupply, lower costs, and greater efficiencies have softened the prices." Despite this, Mr. Thomas stated a strong belief that prices will remain substantially at present levels, pointing to "very large fixed investments, with relatively difficult high-pressure techniques, and inability to start and stop like a production line." On the matter of future supply, though, Mr. Thomas declared, "One thing is almost as certain as death and taxes—the U. S. will have a dependable supply of nitrogen products for years and years to come, at very reasonable prices"

The Spencer official reported there would be ample future supplies

of by-product hydrogen from petroleum reforming processes used in the production of high-octane aviation fuels. A number of oil companies, he said, have moved to production of ammonia from by-product hydrogen. "The potential for ammonia production by this route is staggering, since it is estimated that sufficient by-product hydrogen is available annually to produce 1.5 million tons of ammonia. This source alone would provide a 25% increase in ammonia production."

Mr. Thomas saw increased efficiency of soil usage, through fertilization and other practices, as a solution to the problem of increased yields from decreased available acreage. "Without nitrogen, hybrid corn and other segments of our agricultural advance would not be available. Food and fiber in many areas are possible only because of the world's finest nitrogen supply system."

Phosphatic Fertilizers, 1956

EDWIN Cox, vice-president of Virginia-Carolina Chemical Corp., Richmond, compared the phosphatic fertilizer industry to a court of a generation ago attempting to deal with illiterate traffic violators, declaring that "technological penetration has not proceeded at a pace enjoyed by some of the industry's younger sisters. The industry seeks to maintain free enterprise and yet to a marked degree depends upon governmental research and to some extent socialistic practices."

Tracing the history of phosphates in agriculture, Mr. Cox gave the following summary of recently observed trends in the industry:

"Within the last five years there have been new trends within the industry. Superphosphate continues the main source of P_2O_5 —1,557,000 tons in 1955-56 (estimate) or 69% of the total (6). However, it has fallen from the 1950 total tonnage of 1,684,430 tons of available P_2O_5 and the percentage of the total has fallen more. Concentrated superphosphate more than doubled in the same period — from 309,085 tons available P_2O_5 in 1950 to 690,000 tons in 55-56.

Ammonium phosphates increased from 65,000 to 85,000 tons (also basis available P_2O_5). At the present time diammonium phosphate is entering the market in volume. Liquid mixed fertilizers, also ammonium phosphate, doubled in volume within the last three years, and early reports for 1956 indicate the trend continuing. Calcium metaphosphate introduced by TVA in 1950 attained a volume of 43,710 tons available P_2O_5 in 1955. Basic slag production increased to a slag tonnage of 159,524 tons in 1955, however production is limited to the steel furnaces of Birmingham, Alabama. In these five years, the growth

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of P_2O_5 consumption has been in products other than "superphosphate," which itself declined.

"These higher analysis products have required increasing production of phosphoric acid both by the "wet process" and from "elemental phosphorus." The increase has been 120% over 1950. In 1955, 81% of the wet process acid was used in fertilizer and 12% of the phosphorus produced was converted into phosphatic fertilizers.

As to the future of phosphatic fertilizers, Mr. Cox declared: "Short-range planning alone cannot answer the long range requirements. Food and fiber for the increasing world population depend upon adequate phosphate fertilization, and the fertility of Mother Earth must not be depleted but must be restored."

"The long range trend is clear. Phosphatic fertilizers must perform their pioneering function. As to the short range trend in the U. S., Mr. Cox found the picture fraught with complications.

"Predicating increased fertilization in ratio to population and standard of living increases is not valid. The former ratio of a relationship be-

tween farm income and fertilizer sales has been dispelled (30). Requirements for phosphatic fertilizers will be determined by economic balances of yields and costs which in turn will be largely governed by legislation. Increased consumption will be encouraged by the need for greater economy and larger yields from smaller acreages. Reduction of requirements will be caused by lower acreage and surpluses. Regardless of political measures economic pressure will enforce increasing yields and cost reduction and with it increased phosphatic fertilizer per acre. The rate of increased consumption will be reduced."

6. Increasing plant resistance to diseases and unfavorable weather conditions.

8. Development of root systems of plants.

He traced consumption figures in the U. S. from 75,000 tons in 1900 to the approximately 2 million ton figure last year. He said that even this figure was insufficient, declaring: "More potash is being removed from our soil each year than is being returned. One source has estimated that 5 million tons of K_2O per year are removed from the soils by cropping. Additional losses by leaching and erosion would increase the de-

had in any of the last 15 years. At the same time, our nation has a surplus of corn, wheat, cotton, tobacco and rice — crops which use more than 50% of all the plant food sold in the U. S. In the face of this situation, our industry has expanded until its productive capacity is far beyond the demand.

"Summarizing the principal factors influencing the promotion and sale of fertilizer today, our industry has more plant food to sell than even before, the American farmer has less money with which to buy, and we need fewer of these crops which use most of our product. What other industry faces such overwhelming obstacles?

Describing the present promotion plans carried on by the industry, he declared:

"Our job today is to convince the American farmer that correct plant food application could be used to increase net farm income, and at the same time could contribute toward solving our surplus problem. It so happens that fertilizer today is a production tool within easy grasp of all American farmers. Since 1939, all products which the farmer buys have increased in cost by 129%, whereas plant food has increased less than 10%. Therefore, our product enjoys a most favorable position in today's inflated market.

Mr. Coleman pointed to recent experiments with the Morrow and Jordan plots as giving a possible key to a vast new field of fertilizer possibilities. "These recent results seem to emphasize that with adequate amounts of plant food even soils continuously cultivated can be maintained in a relatively high state of productivity, or restored, if adequate chemical plant foods are added each year."

Pesticide Discussion

"THE most important development since the invention of the plow" Carlton A. Sears, Fine Chemical Dept., American Cyanamid Co., New York, called the development of pesticides. Mr. Sears, presiding over the afternoon session of

Talks on Pesticide Manufacturing Trends; End Use Patterns; Agricultural Chemicals Marketing; Phosphatic Fertilizers; — Highlight Chemical Marketing Sessions

Potash in Food Production

"POTASH is the dominant mineral element in the plant kingdom," declared J. Fielding Reed, of the American Potash Institute, Atlanta. "The ash of living plants often contains as much as 50% potash, and this may be absorbed readily by the plant provided it is in a form that can enter the plant roots." However, Mr. Reed pointed out that up to 99% of the potash in most soils is found in insoluble minerals; so that soil having as much as 20 tons of potassium in the plow depth of an acre may still need potash fertilization.

As to the important functions for which potash appears necessary, Mr. Reed listed these:

"1. The formation of carbohydrates, such as sugar and starches.

2. Protein production in the plant.

3. Normal cell division in plants.

4. Improving plant quality, such as increased weight of grain, flavor, color, and marketability of crops.

5. Stiffening the straw and stalk parts of plants, thus reducing lodging.

ficit. Thus, our 2 million tons added per year fall considerably short of balancing the books."

On the question of potash reserves, the speaker was reassuring. He credited Germany with having the largest potash reserves in the world, which "conservative estimates place at several billion tons." He said that Russia also had reserves in excess of a billion tons, and that reserves in the U. S. are ample.

As had the previous speakers on nitrogen and phosphates, Mr. Reed discounted any future trend toward use of less potash. "The facts are that more potash and fertilizers are essential to assure efficient farming and production of crops at minimum production cost per unit."

Promoting Proper Usage

RUSSELL Coleman, executive vice-president of the National Plant Food Institute, summarized the present ills of the agricultural chemicals industry:

"Our farm customers who use more than 90% of the plant food in this country have received less net income during the last year than they

the Division of Chemical Marketing and Economics Symposium on Chemicals in Food Production, asserted that "we are in the midst of a vast technological revolution, part of which is the development of organic pesticides."

Dr. Jack T. Thurston, director of the Stamford Research Laboratories of the American Cyanamid Co., declared that the objectives of the industry have settled down to (1) replacement of a currently used pesticide with a better one, and (2) discovery of better selectivity and safety factors. As a third objective, he listed the discovery of a completely new compound to cover a situation or a pest not yet brought under attack.

"Generally speaking, at our present state of knowledge as to the needs for pesticides and the ways they function in use, a pesticide development program would have the following pattern:

"The screening of large numbers of compounds to determine activity against various representative pests.

"Further testing of compounds that show a high level of activity against various representative pests.

"Development of an economic method for production of the compound if it is potentially salable.

"Development of analytical procedures for determining residues of the compound on crops treated and for maintaining control of formulations containing the compound.

"Pilot plant production of the compound to prove out the process and to provide larger amounts of material for field testing and initial market development."

As resources needed, Dr. Thurston listed "trained people of all types, facilities (including specialized equipment and labs and greenhouses), and up to date data and general information.

Pesticide Manufacturing

MR. J. Steele Brown, manager of production, General Chemical Co. Division of Allied Chemical & Dye Corp., New York, declared that the "shotgun approach to pesticides is no longer adequate." Taking what he termed a "wistful look back to the

former days when the farmer applied just a few compounds, on a rain-or-shine basis," he said that the "individual insect approach" has come to dominate nearly every recent advance in the pesticide field.

Carrying this trend further, Mr. Brown declared that farmers' estimates are being based on what he thinks a particular insect will do in the future, and that the pesticide industry, must, of necessity, often rely on these uncertain estimates in planning future production schedules.

"We also must recognize the fact," he declared, "that we are in the poison business; and that the producer must himself become an expert on human toxicology, for the materials he is handling are often more deadly than the final product. More and more the manufacturer is finding himself in the role of a drugstore for the entire food producing industry."

As a solution to the vast formulation, research, production, and prediction problems currently besetting the pesticide industry, Mr. Brown called for the establishment of "a greater degree of stability in the industry." "We must," he asserted, "follow along the lines of medicine and public health."

End-Use Patterns

FW. Hatch, manager of the Agricultural Chemicals Division, Shell Chemical Corp., New York, declared that at the manufacturers level the value of pesticides has reached a figure of \$200 million annually. He divided the figure into the following percentages: insecticides, 59%; fungicides, 20%; herbicides, 16%; nematocides 3.5%; and rodenticides, 1.5%.

"It seems unfortunate," he said, "that neither the Agricultural Marketing Service, nor the U. S. Census Bureau, make pesticide usage a part of their routine fact-gathering." Mr. Hatch declared that only one thorough study of this subject on a national scale is carried out for a year, and that is by the Agricultural Research Service of the USDA.

"Crops utilizing less than 3% of our farm crop and pasture land, ac-

counted for the use of more than 56% of all pesticides in 1952; and over 47% in 1955." The change of 9% he attributed largely to the marked increase in use of chemicals for pest control and prevention on large acreage crops, small grains, corn and forage legumes, such as alfalfa and clover. "Today these crops represent 25% of the total U. S. farm acreage."

Mr. Hatch praised the trend toward preventive chemistry rather than the previous *emergency* pest control measures. "Preventive chemical application, looked upon as a form of investment insurance, offers the big advantages of combining operations and at the same time circumventing the problem of residues on foliage and fruit."

Successful Marketing

EDWARD K. Hertel, assistant sales manager of the Niagara Chemical Division of Food Machinery and Chemical Corp., Middleport, New York, credited the discovery of DDT with marking the turning point in the growth of agricultural chemicals. He classified the marketing function into the categories of "merchandising, physical distribution, sales personnel, sales promotion and advertising, and new product development."

"There are many influences that must be considered in successfully merchandising a pesticide. State and federal legislation must be observed and satisfied. The provisions of the Miller Bill have instituted requirements that will benefit our industry and establish a clear cut merchandising picture in respect to the use of the pesticides we market."

Mr. Hertel warned that merchandising plans must take in the weather, pricing, seasonal use factors, and competition. "Our merchandising plans must include the ever-present possibility of the pest we fight developing resistance to the products we are marketing."

He called a clear-cut understanding and the establishment of good two-way communications between

(Continued on Page 125)

**HOW UNION MULTIWALLS BUILD MORE
BUSINESS FOR THE FERTILIZER INDUSTRY**

"In the citrus belt, we're sold on fertilizer in Multiwalls"

***F. M. Hahs, citrus grower,
Land O'Lakes region, Fla.***

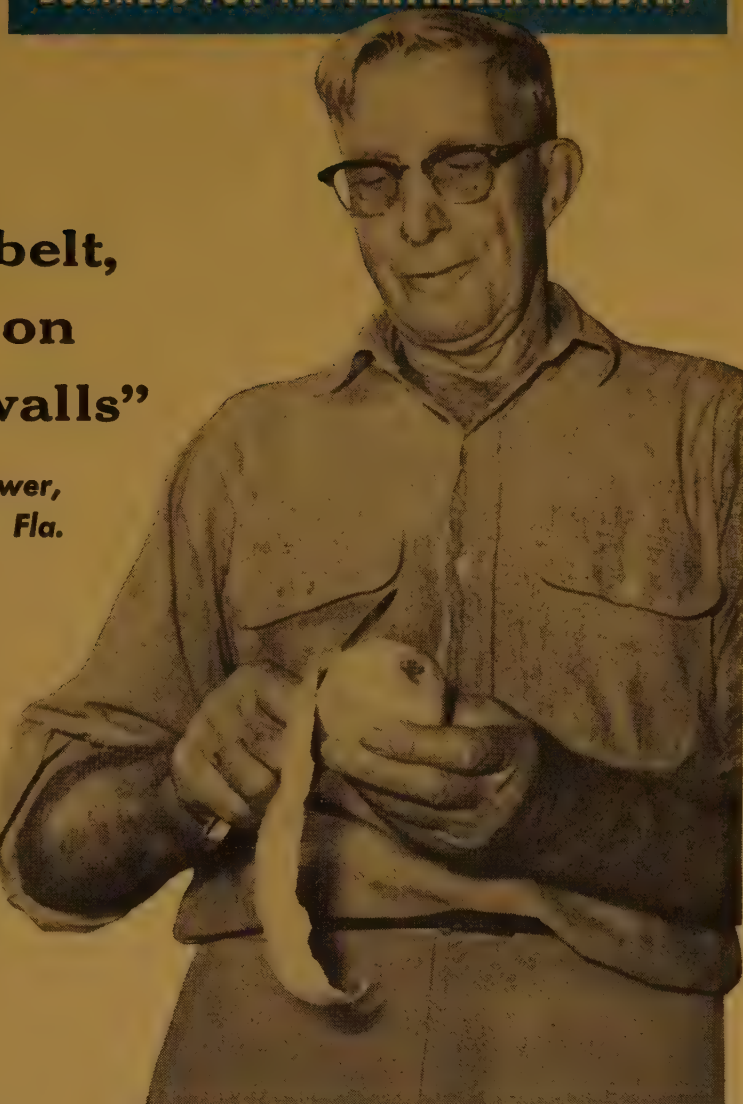
"When you open up an orange like this one," says Mr. Hahs, "you see—and taste—what good fertilizer can do. I've been sold on fertilizer for 33 years, but it's never been as easy to handle as it is now that it comes in Multi-wall bags."

Welcomes fertilizer tips from Union

This veteran citrus grower, who recently won a \$500 award as the "longest steady customer" of the Gulf Fertilizer Company of Tampa, operates his 29-acre citrus farm along scientific lines. He is an interested reader of tips on fertilizer application that come to him through Union's countrywide information program. Union-sponsored features on fertilizer use are seen or heard in newspapers and magazines, and on radio and television stations.

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"Union's Information program helps sell more fertilizer because it shows farmers how to use fertilizer more efficiently."

Mr. R. R. Reed, Sales Manager, Gulf Fertilizer Company, Tampa, Florida.

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Comments on the 10th International **Congress of Entomology**

by Dr. Charles Palm

THE Tenth International Congress of Entomology held at Montreal, Canada will be long remembered by entomologists all over the world as a wonderful experience. For the second time in the history of world congresses of entomology, the meeting has been held in North America, the other meeting being at Cornell University in 1929. Most certainly our Canadian hosts at the Congress are deserving of the sincere thanks of all, not only for their tremendous and successful efforts in planning and executing the program and other functions of the Congress, but for the genial atmosphere in which an international viewpoint of the subject could be discussed. With more than fifteen hundred individuals interested in entomology at one meeting, one felt the growing strength of the profession in a direct and positive manner. In the setting at McGill University and the University of Montreal, including the delightful program of social events and trips as well as the program for the ladies and children, all details of the meeting were eminently successful.

One of the features of the Congress that added greatly to the smooth functioning of the program was the effectiveness of the chairmen of the several concurrent paper reading sessions. Keeping the program on the time table of the printed schedule, and the distribution of brief abstracts of papers at the time of registration, enabled the participants to select the sessions with assurance of being at a particular one at the time the paper was being given. Keeping the program on time when it is so extensive and diverse of subject matter is an accomplishment that contributed much of value to those attending.

The field of entomology has grown into a many-faceted picture.

In early years it was of primary concern to those who were interested in insects as they occur in nature and in turn in their classification, structure, distribution, natural history and the like. Fortunately today there is still a large group of entomologists devoting its efforts to these fields. Such fundamental areas have stimulated the participation of other fields of training that now are brought to bear on entomology. Through the application of chemistry and physics, for example, to the fields of physiology, toxicology and the like, entomologists have made great progress in an understanding of basic life processes in insects. Furthermore, these related sciences have made possible great progress in insecticidal chemistry, insect biochemistry and the mode of action of insecticides. Each related discipline applied to entomological problems broadens the scope and interest of the subject matter and in turn, contributes knowledge of value to other scientists working in the growing science we call entomology. In a sense, a congress of entomologists from all parts of the world, bringing to bear their special interests and results of their investigations on the central theme, the insect, makes one realize how diverse the interests have grown. The insect still remains as the hub of the wheel, unaware of the many avenues of approach that man is using to peer deeper into its private life and vital processes.

Economic Entomology a Broad Field

IT was apparent from the reports on methods of insect control that many parts of the world are relying on biological control, modifications of biological and chemical control and others almost entirely on chemicals. The familiar topics of destruction of natural enemies through the use of

insecticides and the development of resistance on the part of the pest species received much attention. The seriousness of the latter problem in insect vectors of some disease producing pathogens is of immediate importance to public health programs in many parts of the world. Thus far it has seemed easier to deal with the resistance problem on plant feeding species through shift to other insecticides. Considerable interest was shown in the genetics of resistance.

Some workers reported on the compatibility of selective pesticides with natural control for effective insect reduction. It is apparent that the combination cannot be worked satisfactorily in all situations, but combining systemics with natural controls is well worth considering, and perhaps future work will stress this approach even more.

Diseases of insects, caused by viruses, fungi, bacterial and other organisms also received careful attention. It is worthy of note that insect pathology is definitely developing into a prominent position in some fields of insect control and great progress can be expected in the future through the use of diseases that can be used by man to control destructive insect pests. An example in the United States with which we are familiar is the milky disease of the Japanese beetle grub. This disease has proved of great value in the eastern United States in reducing grub populations. The use of virus diseases under experimental conditions for the control of some species of sawflies in Canada also appears to be extremely interesting and promising.

Insect parasites and predators are important factors in the dynamics of many insect populations. Their importance in many of the world areas where insect control is practiced came in for discussion at Montreal. It was interesting to learn that some parasites are developing resistance to insecticides used in their environment; and in the future it may be possible to employ predators and insecticides to supplement each other more effectively than at present.

The papers dealing with insecticidal chemistry and toxicology were

of basic interest to many applied workers. The same was true in insect physiology. The layman in these fields gains the impression that real progress is being made in an understanding of chemical structure in relation to toxicity as well as a better understanding of the mode of action of insecticides. Physiology is contributing materially to the latter field as is the study of insect biochemistry. Unfortunately the average economic entomologist lacks the basic knowledge of the fields to follow the specialists fully, but as with most basic research, once the facts are known, they can be applied to the work of many others in an understandable manner.

Ecology and biology came in for serious discussions. The reasons underlying population dynamics are of continuing interest and form the backbone of much of our applied work. We see the importance of the problems of distribution when pest species like the Khapra beetle and the Mediterranean fruit fly move into the United States. Their impact on the economy of the infested areas is felt immediately and all possible measures of control are brought to bear, along with studies on biology and ecology. All workers on a pest species in its areas of world distribution can contribute to a better understanding of the species in any

one given area. It is this mutual inter-change of knowledge by scientists that is so helpful and stimulating.

Many of the papers on insect control provided for an exchange of experiences on appraisal of insecticides in particular pest control problems. Several review papers gave more perspective to the problem than is possible to get in journal articles reporting on short term investigations. We can begin to see clear pictures developing from the work of the past decade and possibilities that can be realized from reduction of insect losses through the use of insecticides.

Obviously these impressions are not an attempt to report the breadth and scope of the Congress, but rather to reveal the enthusiasm of one who hurried from one session to another with the hopes of getting as much of

an impression as possible of the work in his fields of interest. Entomologists are going forward in their diversified fields of endeavor, utilizing all of the tools available to them and soliciting the aid of other scientists to gain new information. This is true whether it be in insect classification, distribution, physiology, toxicology, various aspects of control, or any other of the many areas of research. The value of the cooperative effort and free exchange of information as well as an opportunity to meet and discuss problems of mutual interest with fellow workers cannot be over-emphasized. We owe the Canadian entomologists and their associates a genuine vote of thanks for providing the opportunity to realize many of these privileges at the Montreal Congress.★★

Briefs on Some of the Addresses at the Congress of Entomology

About Chemical Control

With the Khapra beetle practically under control in the U. S., considerable interest was expressed in the suppression program conducted over recent years in the U. S. and reported by H. M. Armitage, California. Control measures described included fumigation of infested areas

with methyl bromide, and spraying adjacent surface areas with malathion in diesel oil.

Good commercial control of *Sitophilus oryzae* and *S. granarius* in seed corn and wheat, according to D. Barnes, Mexico, can be obtained with DDT, methoxychlor, and dieldrin, mixed with the grain at the rate of 50 ppm. Fumigation with carbon bisulfide and carbon tetrachloride have given good results in Chapingo, Mexico, in control of corn and wheat pests. Reports on control of stored grain pests in the U. S. were presented by W. E. Dove, Maryland; R. T. Cotton, District of Columbia; S. S. Easter, Illinois; L. O. Warren, Arkansas; and D. A. Wilbur, Kansas.

P. J. Spear, New York, outlined some recent developments in structural pest control in the United States, advising that resistance in household pests is probably the most important development of the past few years. He indicated that new equipment being employed includes electronic sound amplifiers for listening for insect activity, injectors for introducing insecticides under concrete slabs, and gas analyzers for measuring concentrations of fumigants.

The tenth meeting of the International Congress was held in Montreal, Canada, Aug. 17, through 25. The Entomology Society of Canada served as host and along with the agencies and individuals which cooperated in bringing the Congress to Canada is to be complimented on making the meeting the outstanding success that it was.

The International Congress of Entomology came into being through the thinking and initiative of Dr. Karl Jordan. It was the belief of Dr. Jordan that although Entomology had a place with the International Congress of Zoology, entomologists should gather together in one group and discuss their common problems. From this thinking evolved the International Congress of Entomology which held its first meeting in Brussels in 1910 with fewer than 150 persons attending. Oxford was the site of the second

Congress and Zurich, Switzerland of the third. The fourth, the only one held on the North American Continent prior to this year, was held at Cornell University, Ithaca, New York, in 1928. The fifth Congress was held in France, the sixth in Madrid and the seventh in Berlin. The eighth meeting, which was scheduled to be held in Stockholm in 1941, was delayed until 1950. Amsterdam, Holland was the site for the ninth at which about 1000 were in attendance.

Fifteen hundred delegates from 67 countries met in Montreal to make the tenth congress the largest held to date. The congress officially began at 2:00 p. m. Friday, August 17 with welcoming addresses at McGill University by Federal, Provincial, and Municipal officials, the heads of McGill and Montreal Universities and the president of the congress, Dr. W. R. Thompson.

Reports on Pesticides

Use of heptachlor as an insecticide was discussed by Stephen S. Easter, Illinois, who advised that at the recommended dosages, there is no phototoxicity and no problem of tainting with this product. He indicated that it is particularly outstanding as a soil insecticide. Worked into the soil, it control wireworms, rootworms, maggots, white grubs, weevils and mole crickets at dosages of one to two pounds per acre. Soil surface treatments result in effective control of ants. Dott. Giorgio Costantino, Italy, reported that heptachlor was particularly effective in control of larvae and pupae of the Mediterranean Fruit Fly. Among several other discussions of soil insecticides one by J. H. Lilly, Iowa, reviewed control of this pest from an overall viewpoint.

Acaricidal properties of 2,4,5,4'-Tetrachloro-diphenyl sulphenone were reviewed by J. Mekltzer, Netherlands, who indicated this compound has a specific action on immature stages of spider mites in many crops. It kills nymphs, larvae and full grown eggs, and affects the eggs developing in the ovary as well.

L. E. van't Sant, Netherlands, advised that of several insecticides tested, chlordane has been the first to meet several requirements for an effective control measure against the carrot fly, *Psila rosae* F.

Systox .05% and Metasystox .1%, according to Juan E. Simon F., Peru, reduce the population of *Empoasca* sp. on cotton fields, — Metasystox, he said, controls this pest more quickly and has a larger residual power. No satisfactory control of *Pinnaspis minor* Mas (fam. Coccidae) was obtained with Metasystox .1%.

Application of fertilizer-heptachlor mixtures in Italy, reported by Ugo Terrosi, Italy, indicated that effective results were obtained with a mixture of granulated superphosphate at 18-20% of P_2O_5 , and .5% heptachlor. This was applied at the rate of 4 qls. per hectare, equivalent to a rate of 2 kgs of technical heptachlor per hectare.

A new insecticidal formulation

for mealy bug control was described by A. S. Srivastava and G. P. Awasthi, India. The formulation is based on the use of a mixture of nicotine sulfate (.15%) and white sesame oil (1.25%) containing sesamin and sesaminol and suitably dispersed (soft soap .25%) to give an emulsion, which has been found effective in mango and guava orchards.

An extract of the plant *Adhatoda vasica* also described by A. S. Srivastava and G. P. Awasthi, is reported to possess insecticidal properties, and may offer some promise in pest control. The greatest advantage of this insecticide is its lack of toxicity to man.

About Biological Action

Reporting on the toxic action of thionophosphate and dithiophosphate compounds which are highly stable compounds, relatively inactive as cholinesterase inhibitors, R. L. Metcalf, T. R. Fukuto and R. B. March, California, advised that these have been shown to be oxidized in plant and in animal tissues to compounds of greater instability which are able to phosphorylate the cholinesterase enzyme and are consequently responsible for the ultimate toxic action. Examples include the oxidative metabolism of the thionophosphates to phosphates, the dithiophosphates to thiophosphates, and of thiol ether phosphates to sulfoxides and sulfones.

The physiological basis for the insecticidal action of organophosphorus compounds was explained by B. N. Smallman, Ontario, Canada, who observed that "evidence that acetylcholine and the mechanisms for its metabolism occur in insects does not establish its functional significance,

nor resolve the anomaly of the insensitivity of insects to exogenous acetylcholine."

An address reviewing biological control of insect pests in the Continental United States, was presented by C. P. Clausen, California, who reported that the first insect parasite imported successfully into the U. S. for the control of an agricultural pest was established on the imported cabbage worm in 1884 as a result of importations from England. The most successful projects from the point of view of effectiveness in control, have been on the browntail moth in New England, the satin moth in alfalfa weevil in the western states, the Comstock mealy bug in the northwestern states, and the cottony cushion scale, black scale, nigra scale, citrophilus mealybug, and grape leaf skeletonizer in California. Field control of the alfalfa caterpillar in the latter state has been accomplished through the application of a polyhedrosis virus in spray or dust form.

Developments in Equipment

In a review of insecticide application to row and field crops, J. L. Brann, Jr., Ithaca, N. Y., pointed out that the "use of new equipment has not necessarily reduced the cost of spraying. The savings in time, labor and water required with some of new equipment are often offset by the high initial investment and cost of operation." The answer, he advised, is not the building of larger machines requiring more horsepower and higher costs . . . progress lies in the direction of a more efficient use of the power being used through a better understanding and application of the factors involved in getting the chemicals from the tanks to the plants.

Reporting on the distribution of insecticides from aircraft, J. C. Chamberlin, Oregon, indicated that aerial applications have been most effective against active insects whose own wanderings insure insecticidal contact, or against exposed semi-sedentary insects such as the pea aphid. They have failed largely where deep

A report in the November issue of AGRICULTURAL CHEMICALS interviews Dr. W. E. Ripper, vice president of Fisons Ltd.

This article includes some of his comments and observations on the International Congress in Canada.

(Continued on Page 66)

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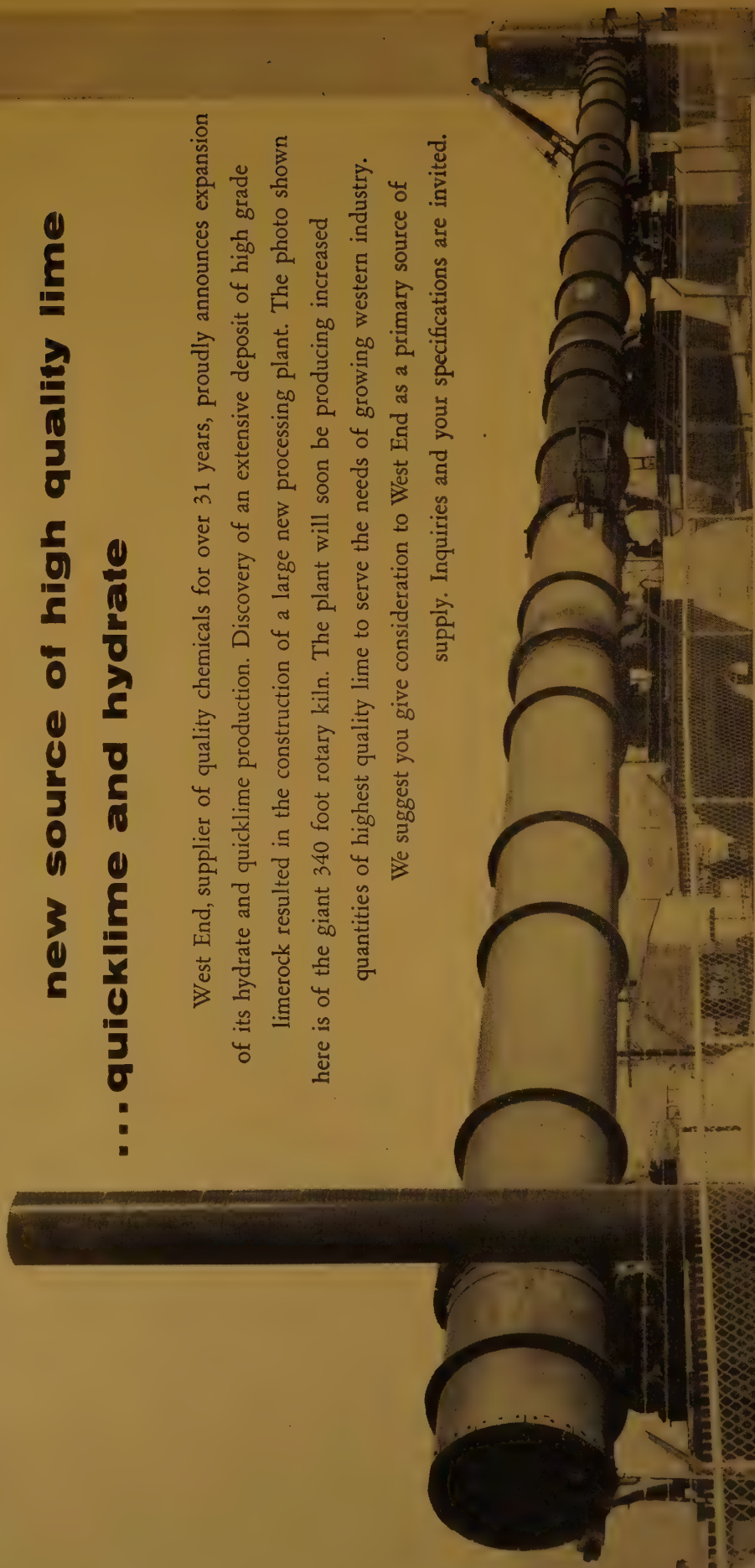
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More about root-tip activities

LAST month several items were given dealing with absorption of plant nutrients and the behavior of chemical ions in the rhizosphere. Another item of interest in this category is the relation of certain fungi to the nutrition of two groups of trees and shrubs.

We have all heard about the nodules on the roots of leguminous plants, and how certain species of bacteria in those nodules live in a mutually helpful relationship with the host plant. The nodular bacteria exchange nitrogen which they fix from the atmosphere for nutritional elements they receive from the legume. A similar mutually helpful relationship exists between certain fungi and certain trees and shrubs. Research both in Great Britain and at the U. S. Department of Agriculture (A.R.S.) has revealed this association which is technically known as mycorrhiza (literally fungus on root).

Two types of mycorrhiza have been described: one, in which the fungus completely covers the ends of a tree's fine rootlets like a mantle and sends some of those filaments inside the root and between root cells, but not into the cell proper; the other, in which the thread-like filaments are caused to enter the root and penetrate directly into the root cell contents. The host plant seems to benefit through a greater absorption of needed plant nutrients present in the root zone. Pine, spruce, oak, elm, beech, hickory and birch display this first type of mycorrhiza. The fungi apparently secrete growth regulating and other substances which help the host plant. In the second case, where the fungi filaments enter the root cell proper, it seems the root tissues digest the filament and absorb it as so much more plant food. The second group of trees comprises poplar, sweet gum, maple, azalea, mountain laurel and rhododendron, both groups being of the kind that prefers an acid soil reaction. Legumes, however, require a neutral or only slightly acid soil reaction.

This research may lead to a better understanding of the conditions

FERTILIZER

Views and News

By Vincent Sauchelli



under which to apply soil fumigants, plant growth regulators, weed killers and other chemicals including fertilizers.

Sulfur as essential nutrient

AMONG the many nutrients known to be essential to plants, sulfur (S) seems to be the neglected member; at least it does not get the play among agronomists that its importance deserves. Physiologists have shown that sulfur is indispensable in building proteins. For example, legumin contains 0.38% S, zein of corn, 0.60%; gliadin of wheat 1.8%. Many important amino acids could not be produced by plants without sulfur: among these are methionine, cystine and cysteine. Certain species of plants utilize sulfur in the formation of specific volatile compounds such as allyl disulfides in mustards and mercaptans. Sulfur also occurs in the glucosides. Sulfur acts in a dual role, that is, as a catalyst and as a plant tissue building element.

In the leaves S occurs in the sulfate form, in the roots in acid-insoluble compounds, and in the seed it is found in the amino acid, cystine. In fact, about 87% of the total sulfur present in seeds occurs in combinations with proteins. It is now generally accepted that sulfur is utilized by plants in the synthesis of proteins. In this respect, it shares honors with phosphorus which is also indispensable in the composition of proteins.

Plants absorb sulfur partly

through their root systems in the form of sulfates and partly through their leaves in the form of sulfur dioxide present in the atmosphere. Recent research implies that the absorption of sulfur is dependent upon the presence of nitrogen; if the soil is poor in nitrogen, the uptake of sulfur will be low. It seems also that the ammonium ion, NH_4 , favors sulfur uptake more than does the nitrate ion, NO_3 . It is worth noting that sulfur, nitrogen and phosphorus are anions, that is ions carrying a negative electrical charge, and are used in synthesizing plant tissues, notably proteins. The cations, calcium, potassium, magnesium, sodium, copper and iron, are ions with a positive electric charge. They act as catalysts, not as constructors of plant tissues. Dr. Firman E. Bear, well-known American authority on soils, observed that the ratio of the sum of cations to that of anions in a plant is always a constant. This may be represented by the equation:

$$\frac{\text{Ca} + \text{Mg} + \text{K} + \text{Na}}{\text{N} + \text{P} + \text{Cl} + \text{S}} = \text{constant}$$

It is more difficult to determine the sulfur requirements of a plant than those of the major nutrients, N, P and K, because of the more limited research data available on sulfur nutrition. Generally, it may be said that plants require as high a level of sulfur as of phosphorus. It is known that the plant utilizes the sulfate ion, SO_4 , much more energetically than it does the H_2PO_4^- , or phosphate ion. However, this much can be said at



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present: plants require much higher amounts of sulfur to reach their full development than they are usually considered to need, while the available amount of sulfur in soils is generally lower than most agronomists and others think it is.

With the increasing use of concentrated superphosphates in place of normal supers, and the diminishing use of sulfate of ammonia and of sulfur pesticides, this matter of providing adequate amounts of sulfur to soils for the proper nutrition of crops is assuming greater importance every year.

Phosphorus may not be ignored

AMONG plant nutrients nitrogen has been receiving the major play these past few years. That is understandable. The relatively lower cost of this nutrient from industrial sources following the war years and its dramatic effects in promoting crop growth especially on soils of high phosphate content, plus an unusually aggressive sales promotion campaign, have stimulated heavy consumption. Anhydrous ammonia sales for example leaped from about 20,000 tons in 1946 to about 470,000 tons for the 1955-56 fertilizer year. About 20% of the nation's nitrogen consumption is now in the form of anhydrous ammonia for direct application to the soil. This increasing use of nitrogen in agriculture is all to the good. But a word of caution may be pardoned: in this all-out enthusiasm for nitrogen fertilizer, let no one forget phosphorus.

Phosphorus is essential to plant growth and the most profitable farming is that in which the fertilizer nutrients are kept in balance. Agronomists recognize that nitrogen has to be balanced with phosphorus for maximal crop yields and vice versa.

Most crop soils in all countries have a low or inadequate supply of available phosphorus. Recent surveys in Pennsylvania and New York serve as a reminder, if such were needed, of the deficiency of phosphorus in their crop soils. Reviewing the county survey data from Pennsylvania, which are based on a large number of soil tests made by the State Uni-

versity, the picture is none too favorable: 58% of the soil samples from Bradford County tested very low and 23%, low in phosphorus; Columbia County 44% very low, 24% low; Crawford County, 73% very low, 18% low; Erie, 68 very low, 19 low; Potter, 64 and 18; Susquehanna 51 and 24; Tioga, 60 and 25; and so on.

Let us now take a quick look at some United Nations data on this subject which apply to foreign countries. Three million soil samples from Germany and Austria tested 50% deficient, 30% average and only 20% sufficiently provided; Belgium: 17,000 soil samples, 42% deficient; Denmark, 23,000 samples, 55% deficient; France, southwest region, 1,200 samples, 70% deficient; Netherlands, clay soils, 70% deficient; Italy, 2,000 samples, 50% deficient; Sweden, 2,177 samples, 70% deficient.

We have previously referred to the depletion of phosphates and other minerals in the western Corn Belt when nitrogen was being used exclusively. The eventual drop in yields and quality of the corn was recognized as due to an imbalance of plant nutrients, especially to the nitrogen-phosphorus ratio. Current fertilization practices reflect the improvement induced by proper balancing of plant nutrients.

Fertilizer placement

GEOORGIA soil scientists working on the problem of how best to fertilize peanuts have reported results which indicate that placement of the fertilizer is a very important factor in getting maximum yields*. They applied the fertilizer in various ways: in a furrow, stirred into the soil, bedded down, and allowed to remain as placed for two weeks or until it rained before planting the seed. The results varied with placement technique: phosphate decreased yields of Spanish and runner peanuts if supplemental lime was omitted. Spanish peanut types responded to nitrogen only, while larger-seeded peanuts responded to phosphate and potash when lime was supplied.

Since the peanut has an extensive root system with a long tap root and

had shown response to calcium when placed at different depths, the investigators decided to study further this zone placement effect on yields. Fertilizer was placed 4" deep and 2" to the side of the seed as a check. Comparisons were made by placement at 8" and 14" depth directly under the seed. Results varied as would be expected, but with definite indications that in these placement studies it is necessary to investigate the effect of depth on fertilizer response. In other words, the natural root system of the crop concerned needs to be considered and fertilizer placed in relation to its spread.

In these Georgia tests, for example, a 6-0-6 fertilizer placed at a 4" depth outyielded a 6-6-6; this showed that phosphorus depressed yield. But at an 8" depth the complete 6-6-6 fertilizer outyielded the 6-0-6. At the 8" depth the phosphorus was responsible for most of the increase in yields: that is, a difference of 4 inches in depth changed a phosphate response from a 3% decrease to a 10% increase in crop yield. Heretofore, in most of the very extensive fertilizer placement studies in all parts of the country, depth in relation to the seed and root system has not been given sufficient consideration. Perhaps in future investigations it may be wise to take account of the possible influence of zonal placement on the effectiveness of each plant nutrient.★★

* Paper No. 300 Journal Series Ga. Expt. Sta. Expt. Ga.

Nemagon Used for Root Rot

Applications of nemagon around the roots of living peach trees, at rates of five gallons per acre, have shown good promise for controlling peach root knot, researchers at the South Carolina Agricultural Experiment Station, Clemson, report. Peach root knot, caused by nematodes, is a major problem for peach growers in South Carolina, and the one year tests have shown promising results. (A complete article on nemagon appeared in the March issue of *Agricultural Chemicals*.)

LISTENING Post

Studies on Control of Cucumber Scab and Peach Root Knot

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Epidemics and Identification Section, Horticultural Crops Research Branch, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller



SAUL Rich of the Connecticut Agricultural Experiment Station writes that cucumber scab, caused by *Cladosporium cucumerinum*, is not controlled adequately in Connecticut by field spraying. One of the factors contributing to the field failure of fungicides is the difficulty of covering the undersides of the large, limpid, groundhugging leaves of the mature cucumber vines. Fruit protection is difficult also because of the speed with which the fruits develop. Chemotherapeutants might protect these inadequately covered leaves and fruit.

Although captan acts as a chemotherapeutant against cucumber scab, it still is not adequate on cucumbers in the field. Zineb controls scab on open-growing summer squash, but is not effective in the field against scab on cucumbers. Results of an experimental attempt to increase the chemotherapeutic activity of these two fungicides and streptomycin by the addition of glycerin are reported. Streptomycin was tested because it is translocatable when applied to above-ground plant parts, and because it was found in preliminary experiments to be a weak protectant against cucumber scab.

The concentrations used were 2500 ppm of a 50% captan wettable powder, 2500 ppm of a 65% zineb wettable powder, 200 ppm strepto-

mycin in 15% wettable powder, and 10000 ppm of glycerin.

Cucumbers, variety Marketer, were grown in sand, 5 plants per box. When the plants showed two true leaves, they were sprayed once, three boxes per treatment, and kept in the greenhouse at 80° F. When the third leaves were partially developed, 4 days later, the plants were inoculated with *C. cucumerinum*. The inoculated plants were incubated overnight in a moist chamber at 65° F. Afterwards they were kept in a greenhouse at 70° F. until symptoms developed. To test the chemotherapeutic activity of the treatments, the amount of scab developing on the third leaf, which had received no spray, was estimated on the sixth day after inoculation. The disease readings were graded in severity from 0 for no disease, to 10 for complete death of the leaf. None of the treatments were phytotoxic.

The results are given in Table 1.

TABLE 1.
Chemotherapeutic activity of spray applications or the control of cucumber scab. Added glycerin used at 10,000 ppm.

Material	Concentration (ppm)	Average severity of disease on third (unsprayed) leaf ^c
Captan	2500 of formulation ^a	5.6
Captan plus glycerin	"	4.1
Zineb	2500 of formulation ^b	7.1
Zineb plus glycerin	"	4.9
Streptomycin	200	10.0
Streptomycin plus glycerin	200	8.2
Glycerin	10000	10.0
Check	"	9.7

^a50% wettable powder.

^b65% wettable powder.

^cSeverity rating: 0 for no disease, to 10 for complete death of leaf. L.S.D. at the 20% level=1.9.

Table 2.
Peach root knot control following the use of Nemagon. Values represent an average of results obtained from 2 to 4 trees per treatment. South Carolina 1955.

Treatment: Nemagon per acre (gallons)	Average of maximum shoot Length (Inches)	Average increase in tree trunk circumference (April 19-Sept. 22) (Inches)	Root knot symptoms (0-5) ^a	Appearance on Sept. 22 ^b	Tree vigor ^b
40.0	7.0	0.125	0	4	4
20.0	11.25	0.8125	0	2-3	3
10.0	32.75	1.75	0	2	2-3
8.0	50.5	1.5625	0	1-3	2
5.0	49.125	2.5625	0-1	1-2	1-3
2.5	47.25	2.375	1-2	1-2	2
None	24.0	1.3125	3-5	—	3

^a0 — No galling; 5 — Severe root knot galling.

^b1 — Excellent; 2 — Good; 3 — Poor to fair; 4 — Dying or dead.

The treatments in order of chemotherapeutic activity were captan plus glycerin, zineb plus glycerin, captan alone, zineb alone, and, finally, streptomycin plus glycerin. Streptomycin alone, and glycerin alone were grouped with the check as being entirely ineffective.

Treatments containing captan and zineb were significantly better than the check. Zineb was significantly improved by the addition of glycerin. Both captan and streptomycin, however, showed non-significant improvement by the addition of glycerin.

These results suggest that glycerin would improve the field performance of captan and zineb. The addition of glycerin would probably be worthwhile for controlling scab on summer squash. It is questionable whether or not glycerin would improve the field performance of these fungicides sufficiently to protect cucumbers against scab.

Control of Peach Root Knot

H. H. Foster and L. W. Baxter of the South Carolina Agricultural Experiment Station present data from exploratory experiments that were designed to determine whether or not peach root knot caused by *Meloidogyne* spp. could be controlled effectively by the use of Nemagon (1,2-dibromo-3-chloropropane) applied to soil around living peach trees.

The acreage planted to peaches has increased rapidly during the past 2 years in Allendale, Barnwell, and adjoining counties in South Carolina. The soil type is primarily sandy loam. Most of this acreage has been planted with trees on a susceptible rootstock. Disease surveys have indicated that root-knot nematodes are a major problem confronting peach growers in this area.

During April 1955, Nemagon was applied to soil around Southland peach trees in a Barnwell County commercial peach orchard. Trees with roots, which were moderately to severely galled at the 6- to 12-inch level, were selected for the nematocide treatments. Two to four trees were included in each treatment. Six rates

(Continued on Page 127)

Bollworms Damaging Cotton Crops; Other Pests Active

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Plant Pest Survey Section, Plant Pest Control Branch, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the U. S.

By Kelvin Dorward



Grasshoppers Active Late in Season

GRASSHOPPERS continued to cause concern in many states during late August and early September, a time that normally sees a lessening of grasshopper activity. Several areas of Idaho carried threatening populations of grasshoppers in late August. In Washington county over 25,000 acres of crop lands had threatening populations as did 4,000 acres in Adams county. In the White Bird area of Idaho county over 112,000 acres carried a population classified as severe. Several infestations in Idaho county had counts of over 100 grasshoppers per square yard. Populations continued high in several areas of Utah, particularly Cache and Box Elder counties. Control was being planned in early September for 70,000 acres of grazing land in Santa Cruz county, Arizona where general populations were causing serious damage. Crops were also being damaged in several areas of eastern Colorado. Controls were necessary to protect flax and soybeans from damage in several areas of North Dakota. In some unsprayed flax fields, from 25-50 percent of the bolls had been clipped and were on the ground.

Adult grasshopper surveys in northeastern Kansas counties showed populations about the same as last year, light to threatening. In northwestern Kansas counties light to threatening populations were recorded, but this is lower than the population was at the same time last season. Marginal damage to sorghums, soybeans, corn, cotton, truck crops and legumes was continuing in Oklahoma in early September. Local heavy infestations were reported from several western Arkansas counties during the period, but little damage was appar-

ent. Sufficient populations were present over much of Missouri to be a threat to alfalfa, red clover, pastures, fall-seeded small grain and legumes. Some damage was occurring to the margins of fall-seeded small grains in the southwestern part of the state. Marginal damage from grasshoppers was reported also from Illinois and Minnesota. Early reports on the adult survey in Minnesota indicated many counties with severe to very severe populations. Damage was occurring to new alfalfa seedings in Wisconsin, with more trouble anticipated. Heavy localized or general populations were reported from 18 Wisconsin counties.

Cereal and Forage Insects

THE fall armyworm was reported as being active from Maine to Texas during late August and early September. At Winslow, Maine, approximately 15 percent of the corn showed infestations August 15. In areas of Delaware, the insect caused heavy damage to late corn while in Maryland the damage was spotty. Populations reached outbreak proportions on the Eastern Shore of Virginia. Several other areas of the state also reported high populations. Heavy infestations on millet were reported from Spalding and Meriwether counties, Georgia. Corn and bermuda grass were infested in Tift county, Georgia, with 100-125 larvae being taken per sweep. In late August, the insect continued a threat to several crops in Alabama and infestations were reported from Mississippi. Louisiana reported general infestations over the state with light to heavy populations in grass. As many as 250 larvae per 100 sweeps were taken in alfalfa in Caddo Parish, and 60 per 100 sweeps in Bossier Parish.

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In Missouri, up to 60 percent of the late-planted corn in the southwestern and central parts of the state showed fall armyworm damage. Some irrigated corn in Decatur and Norton counties, Kansas showed 40 percent infestation. Irrigated corn and maize in Milam county, Texas was heavily infested, as were peanuts in Morris county.

Corn and other crops were infested with the corn earworm in many areas of the country. In late August, a moderate infestation of the insect was reported from the Monmouth, Maine area. Some damage to corn occurred in Rhode Island, but by early September the larvae were leaving the ears. The infestation was moderate in corn reaching Maryland canneries, but in general infestations were lighter than normal. In the northeastern counties of North Carolina 60 percent or more of the peanut plants were infested, and grain sorghum heads were being attacked in some areas.

The corn earworm with other caterpillars damaged soybeans in northeastern South Carolina. Heavy infestations were reported from Georgia, and counts of from 70 to 95 percent infested ears were recorded from Alabama. The worms were heavy in north central West Virginia, and 75 to 100 percent of the late sweet corn in Ohio was infested. In southwestern Kentucky, sorghum was considerably damaged, with counts up to 30 larvae per head. Counts in Missouri during the period showed an average of two larvae per head of grain sorghum in the southwestern and west central parts of the state. Field corn in the southern half of Missouri had an ear infestation of 95 to 100 percent. Sorghum and alfalfa were being attacked in Oklahoma, and populations of near outbreak numbers were recorded in some sorghum fields of southwestern Illinois. Infestations in corn in the northeastern part of Kansas and southeastern part of Nebraska were high, with practically a 100 percent infestation. Heavy infestations were reported from the southeastern area of South Dakota and Colorado. Areas

in New Mexico reported moderate to heavy damage to field corn from the corn earworm, and controls were necessary in canning corn in Utah county, Utah. In the Lewiston area of Idaho, late sweet corn was practically 100 percent infested. Infestations in the Willamette Valley of Oregon averaged 10 to 15 percent, and were prevalent but scattered in the Columbia River Basin and Yakima Valley of Washington.

Cotton Bollworm Active

DURING late August and early September the cotton bollworm was causing concern in areas from California to South Carolina. During August, economic populations of the insect were reported from areas of Kern, Tulare and Imperial counties, California. In parts of Arizona the bollworm was the primary pest; in New Mexico, and generally over most of the cotton growing areas, damage was light to moderate with some occasional heavy infestations. During the latter part of August, the insect was the principal problem in the north and south plains, south central and central Texas areas. Irrigated cotton in Oklahoma carried the heaviest infestations, but some eastern counties reported damage up to 10 percent. Populations were high in most irrigated fields in Arkansas, and control was necessary in some Missouri fields. The worms were a threat in several Louisiana Parishes; and although increasing in the delta area of Mississippi, had caused little damage. In the western counties of Tennessee, the worm was causing damage in weevil-infested areas. Alabama in late August reported a two percent infestation in nine central counties, and Georgia reported injured bolls ranging from 3 to 12 percent in 17 counties. By early September, bollworm damage was on the increase in Calhoun, Lancaster and Spartanburg counties, South Carolina.

Spider mites were an economic problem in many fields throughout the San Joaquin Valley of California. Spotted heavy infestations were reported from Arizona, Texas and

Oklahoma. Controls were warranted in about one-third of the fields surveyed in Missouri. Heavy spotted infestations were reported from other cotton-growing states, but little control was being applied.

Encephalomyelitis in Several States

ENCEPHALOMYELITIS or sleeping sickness of man and animals, a disease borne by mosquitoes, has been reported from several states recently. During August, a number of cases of the disease—both in human beings and horses—were reported in the state of Washington. In one area of Lee county, Virginia, there was an outbreak of the disease in horses. Wise and York counties, Virginia, also reported one case each, with a possible case in King George county. Several cases of the disease in horses were also reported in the lower Eastern Shore of Maryland.★★

Nitrogen Effects on Potato

The effects of nitrogen fertilization upon the chipping quality of potatoes is the subject of a recent paper by Tom Eastwood and James Watts, horticulturist and assistant horticulturist, respectively, of the Wise Potato Chip Co., Berwick, Pa. Their findings, as published in the *American Potato Journal* (No. 7, Vol. 33, July), are as follows:

The direct effects of nitrogen fertilizer upon the specific gravity of the potato tubers was erratic in direction and unclear in magnitude, depending upon other conditions. Rather low and rather high levels of N applications resulted in a slightly higher specific gravity than developed from the medium levels of N. In general, the direct effects of N in the ranges which supported both suitable total and graded yields exerted little practical effects upon the specific gravity of the potatoes.

The per cent of sugar was not altered to any practical extent by various N treatments. Though the amount of data was limited, no trends were indicative of any effect of nitrogen fertilization upon the flavor of the chips.

WASHINGTON *Report*

by
Donald G. Lerch

Cornwell, Inc., Washington, D. C.
(Agricultural Chemicals Washington Correspondent)

KEY issue in the battle for the farm vote hinges on two words—direct payments. This is the essential difference between the Democratic and Republican farm planks which are remarkable because of their similarity on most matters.

As the Republican campaign enters the homestretch, it will be aimed at putting an end to what may be left of the so-called Brannan Plan for direct payments to farmers and other parts of the Democratic philosophy. On the other hand, the Democrats intend to capitalize on the tremendous drop in farm income during the past several years and to emphasize that the Republicans have not really made any concrete improvement in the farm program. Democrats are emphasizing conflict — Republicans — cooperation.

Here's what both parties agree on:

- Full parity
- Farm prices are too low
- Expanded research
- Reducing surpluses
- Expanded crop insurance
- Encourage REA

The facts behind the continuing debate over the level of price supports are these:

1. A system of flexible supports was enacted late in 1948.
2. One device or another was used so that flexibility and the lower level of price supports was never permitted to become operative.
3. Secretary Benson's first major move was to reintroduce flexible price supports.

4. Secretary Benson wanted flexibility to range from 75% to 90%, but Congress insisted on 82½% to 90% for 1955.

5. Earlier this year Congress passed its first farm bill which the President vetoed. When he vetoed the bill, the President pegged the price of the basics at 82½% of parity, thereby again nullifying the scheduled operation of flexible price supports.

You could almost say this comes in the realm of New Year resolutions which everyone firmly resolves to keep but then breaks year after year. Agricultural interests on a bi-partisan basis endorse flexible price supports, but also on a bi-partisan basis they are opposed.

Many agricultural leaders in Washington see that the farmers' problem is basically economic, but that we're trying to solve it by political action. They point to a number of basic economic trends which are taking place in agriculture and which will probably continue regardless of who wins at the polls. As businessmen selling the farmer, here are some in which you may be particularly interested.

While our farm population has been dropping, the size of farms is increasing. During the last five years, farm size has increased an average of 16 percent. Capital investment in agriculture per farm worker is more than \$14,000. The average investment for workers in manufacturing industries is \$2,000 less per worker.

More than half of the young farm men and women leave the farm

before they are 25 years of age. Actually a huge migration from farms to cities is now in progress.

Our total cropland base today is about the same as it was in 1920. However, for every ten farmers we had then, we have only seven now. From 30.5 million people living on farms in 1940, the number has dropped to 22 million in 1955 — that's down 25% in the last 15 years. What's more, against this reduction in farm population and a proportionate decline in the farm labor force, the output of agriculture in these same years has increased by 35 percent.

Never in the history of the world have so few produced so much for so many. Farm output has risen faster than even our rapidly growing population. According to the U. S. Department of Agriculture, production per man hour on farms has increased more rapidly than in urban industry — here's a challenge from the farm to the city.

Aside from the figures on consumption of farm chemicals which you know from your own business summaries, farmers use about 7 million tons of finished steel a year, 300 million pounds of raw rubber, over 17 billion gallons of crude petroleum, and 20 billion kilowatt hours of electricity. There are 12 million tractors, cars and trucks on U. S. farms, a million grain combines, 700 thousand mechanical corn pickers, and over 700 thousand farms have milking machines.

The progress made by agriculture is reflected in the family food basket. According to Paul S. Willis, President of the Grocery Manufacturers of America, Inc., the average wage earner had to work 51 hours to buy a month's supply of groceries in 1952. Today he works 41 hours. This means he's getting more food for his work than he did in 1952. What's more, many of the foods that he and his wife buy today have built-in maid service — they are washed, cut, chopped, and often times pre-cooked.

In reality farm prices have been so low since 1952 that farmers have

been losing equity all during that period. Were it not for the continuing inflation in farm land, which makes it appear as though farm assets are going up, the balance sheet of agriculture in dollars and cents would show more red. The paradox of increasing farm land values in the face of declining farm prices apparently results from farmers struggling to increase income and efficiency by upping the size of their farm operation.

While the writer has his own political views and intends to vote them, it is sufficient to say in this non-partisan column that fundamentally agriculture's problems are not political, and that agriculture is divided geographically more than it is on the basis of party politics. Regardless of who wins the election, the farm problem is likely to be here for a long time.

Business in agricultural chemicals should increase over coming years as more of the land in cultivation is farmed more efficiently. As the size of our true farm population decreases, those farmers remaining probably will have larger, more efficient operations, and will more readily recognize the values of applying fertilizer and pesticides in accordance with the tested recommendations of their own agricultural experiment stations. Within the next decade we should see the day when farmers apply more than half as much fertilizer as their experiment station recommends, which is the case in many areas today. Also farmers will consider the application of pesticides and herbicides a regular production practice rather than an emergency measure.

Therefore my election prediction is that over the longrun your business is bound to prosper, and that the agricultural market, instead of shrinking, is actually increasing. In the years ahead it should consume more and more of the products of industry.

* * * * *

Despite reports to the contrary, W. B. Rankin, Assistant Director of the Food and Drug Administration,

does mean every word of the two paragraphs of his formal talk which he did not read orally during his address at the Spring Lake Meeting of the National Agricultural Chemicals Association. Copies of the printed talk have been distributed through the Association to the entire membership, and of course the document was released through the press office of the Food and Drug Administration.

For those who are still wondering about the departure from printed speech, Mr. Rankin informed *Agricultural Chemicals* that the two paragraphs were deleted by him in the interest of staying within the time allotted for the presentation of his and other papers that morning.

The two paragraphs in question are:

"When we went into the educational campaign last fall 'Follow The Registered Label,' we realized as you did that there would be some labels with directions that would leave residues not in complete harmony with the law. We believed that there would be few such incidents, and the evidence of the current growing season has justified that belief."

Then there followed a short paragraph which Mr. Rankin read, then the next to the last paragraph in his speech which he did not read was as follows:

"We would like very much to continue in 1957 the 'Follow The Label' educational campaign. However before deciding to do so we will need greater assurance than was available last year that the registered label directions will yield crops that are legal from the standpoint of spray residues."

Oftentimes the deletion of a paragraph or two from a government official's speech is not even noticed. In this case, however, there is a great deal of interest and some concern over the future course of the "Follow The Label Educational Program." The Pesticide Regulation Branch of the U. S. Department of Agriculture is struggling through a survey to determine the status under Public Law

518 (Miller Bill) of every food or feed use now registered under the Federal Insecticide Fungicide and Rodenticide Act. These uses are being compiled on a chemical by chemical basis. The National Agricultural Chemicals Association is cooperating.

While this involves a tremendous amount of work by the Department of Agriculture, NAC, and the basic manufacturers involved, and apparently is a necessary step, it's doubtful that any new major uses for pesticides will be uncovered for which tolerances have not already been established, or at least considered. Nonetheless this exercise is considered essential so that the machinery of the law can operate, and so that the label can actually be the shield upon which all can rely.

Of course the more cooks you get in the kitchen, the more herbs you get in the stew. The Department of Agriculture's basic viewpoint on nearly all questions is to get the food produced and sold. The Food and Drug Administration's point of view on food is — is it safe? Each tries to see the other's point of view, but nonetheless there is a fundamental difference in their position and, according to Congress, this is the way it should be.

From a very practical point of view, farmers are going to be planting again this spring, and colleges are responsible for putting out spray schedules which afford the farmer protection for his crops and protection against law suits when the directions are followed. Furthermore these spray schedules will begin rolling off the college mimeograph machines shortly after New Years. This doesn't give much time for everyone involved to run through this exercise. As things now stand there are over 1,250 tolerances if you consider each crop and each chemical as a number. Furthermore there are 200 to 300 more applications that have already been passed on where there is no residue problem. Whatever comes of the present "Read the Label Operation," it might be well to keep in mind that at the end point a busy

(Continued on Page 129)

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Technical SECTION

OS 2046 Controls DDT-Resistant Cabbage Looper

THE cabbage looper has become so resistant to DDT in western New York that control with it, even at greatly increased dosages, is no longer satisfactory.

The data presented represent mortality obtained with a single application to an established infestation. While control is undoubtedly inferior to that possible using the same toxicants in a properly timed spray schedule, the relative effectiveness of the insecticides is clearly indicated. Whether or not high temperature was a significant factor in the poor response to DDT applications (Wene 1954) is not evident, as the maximum daily temperature was in excess of 75° F. during each spray test herein reported. Information available (Wigglesworth 1955) would indicate that for certain insect species, increased temperatures, within limits, increase an insect's resistance to poisoning with DDT. This increased resistance, however, may be outweighed since the insect's greater activity at higher temperatures will expose it to more toxicant. In 1944 when DDT gave excellent control of the cabbage looper (Table 1) the mean temperatures during July and August at Geneva were 73.3 and 74.0° F., respectively, while for the same months in 1955 values of 76.4 and 73.9 were obtained.

Of the materials tested endrin, isodrin and Shell OS-2046 gave excellent control while dieldrin, toxaphene, Bayer 17147, parathion, Diazinon and a mixture of DDT and parathion did not give practical control. A combination of parathion and toxaphene reduced looper populations 75% in these tests.

Evaluation of Newer Insecticides for Control of DDT-Resistant Cabbage Loopers by F. L. McEwen and G. E. R. Hervey. *Journal of Economic Entomology* 49, No. 3, pp 385-387.

Study Nitrogen Response

Limited experimental results in the Northeast have indicated no increases in potato yields from methods of application and placement other than applying all the nitrogen in the row in the standard side-placement method at planting time.

However, with high rates of fertilizer, all applied in the row side bands, greater care must be exercised to obtain precise placement to avoid fertilizer injury to seed and sprouts, which can be very serious, primarily under dry soil conditions. In an experiment with complete fertilizer in 1944, (Smith) it was found that applying one-half the fertilizer broadcast, then plowed, plus one-half in equal-depth bands at planting time, resulted in yields of 356 bushels per acre—as compared with 323 when 2400 pounds of 5-10-10 per acre were applied all in bands.

Potatoes may be fertilized effectively at less cost by sidedressing part of the nitrogen as ammonium nitrate or urea shortly after emergence but before they are over approximately eight inches high. By sidedressing part of the nitrogen, less nitrogen is subject to leaching (particularly on sandy soils), and the hazard of seed-piece burning and injury to the young plants is reduced as compared with applying all the nitrogen in bands at planting time.

Growers are cautioned against using too much nitrogen. Excessive use will delay maturity and may result in tubers lower in dry matter and more susceptible to bruising. Also, lower yields may result if weather, insect and disease control are not favorable.

Response of Potatoes to Fertilizer Nitrogen in the Northeast, by Arthur Hawkins. *American Potato Journal* Vol. 33, No. 7, July '56.

Dow Phosphorus Insecticide

"DOW-ET-14," a recently developed organic phosphorus insecticide (0,0-dimethyl 0-2,4,5-trichlorophenyl phosphorothioate) was shown to exhibit "impressively low" mammalian toxicity in tests conducted by the research staff of The Dow Chemical Co., Midland, Mich., producer of the insecticide. It was also demonstrated to be very active against a number of dipterous insects, and especially effective for residual control of the house fly. Not yet fully evaluated as a general insecticide, it has reportedly shown considerable promise against mosquitoes, biting flies, vinegar flies, cockroaches, and certain pests of stored products. "DOW-ET-14, A New Organic Phosphorus Insecticide," by O. H. Hammer, in *Down to Earth*, Vol. 12, No. 1, Summer 1956.

Preharvest Killing of Vines

The use of such chemicals as sodium arsenite and di-nitro compounds is not subject to provisions of the Miller Bill. These chemicals are subject to Section 406 of the Federal Food, Drug and Cosmetic Act.

In line with information that is now available regarding residues of these materials, earlier recommendations covering their use as vine killers still stand unchanged. In the past few years sodium arsenite has been the main chemical used by potato growers.

The vine killers should be applied at least ten to fourteen days before harvest or when the highest percentages of tubers reach 2¼ to 3½ inches in size. Sodium arsenite, Sinox General, Dow 66 Improved or Cop-

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per Sulfate will give good results. The directions of the manufacturer should be followed.

Copper Sulfate should be used without lime at a rate of 30 to 35 pounds per acre, but is not so effective as the di-nitro or the arsenite compounds.

The amount of discoloration which occurs from vine killing with chemicals seems to be associated with the amount of moisture in the soil at the time of vine killing, according to experiments conducted in North Dakota, Iowa and Colorado.

New Jersey states that if a spreader such as Triton B-1956, Ultra-wet or one of the Vatrols is added to sodium arsenite the herbicide may be used at $\frac{1}{2}$ to $\frac{3}{4}$ of the recommended rate with excellent results.

Wisconsin recommends the use of Dow General or Sinox General types of herbicides; to be used at 2 to 4 pints per acre in 5 gallons of fuel oil and 80 to 125 gallons of water. Thorough coverage of the vine is essential. Dow Premerge or Sinox P.E. types can also be used for potato vine killing according to the Wisconsin report.

The efficiency of these vine killers is reduced appreciably by low temperatures. Best results are obtained above 70° F.

Surfaces of exposed tubers are almost certain to be covered with the vine killing solution. Normally the exposed surface will break down into either a wet or dry rot condition depending upon weather conditions, etc. Growers using chemicals should be especially careful to remove these tubers during the grading operation. Robert Kunkel—*Veg News* 8-27-56.

CMRA in Sept. Meet

The Chemical Market Research Association held its annual meeting at the Chateau Frontenac Hotel in Quebec City Sept. 26-28 with the theme "Canadian Industrial Development and the Canadian Industry." Among the speakers were Dr. R. S. Jane, president, Shawinigan Chemicals, who reviewed "Research in Canada," and J. A. Davis, duPont of Canada, who reported on "The Demand for Chemicals in Canada."

Lettuce Diseases Studied

A disease of lettuce that caused considerable damage to commercial plantings in California was reproduced by the application of toxic concentrations of inorganic commercial fertilizer materials or of animal manure. A comparison of the relative toxicity of the several fertilizers revealed that those containing ammonium hydroxide and free ammonia were most toxic, but that certain other materials containing nitrites, nitric acid, or phosphoric acid were also toxic.

Materials composed of neutral salts, such as ammonium sulfate, ammonium nitrate, or calcium nitrate, were relatively innocuous. An explanation of the etiology of the previously described diseases on the basis of toxic nitrogen compounds formed during the decomposition of organic nitrogenous materials in the soil is suggested.

"Fertilizer Injury and Its Relationship to Several Previously Described Diseases of Lettuce" by R. G. Grogan and F. W. Zink. *Phytopathology*, Vol. 46, No. 8, August 1956.

Insecticide Residues in Milk

The chlorinated hydrocarbon and some of the organic phosphorus insecticides are fat-soluble and when sprayed on cattle or sheep may be absorbed through the skin and stored in the fatty tissues. They also may be stored in the fat when present as contaminants of feed, and they may be excreted in the milk of dairy cows exposed to them in sprays or feed. Therefore, before an insecticide can be recommended for use on livestock or for the control of insects on pasture and forage crops, studies must be made to determine whether or not the dosages used will lead to meat and milk contamination, and if residues are produced how long they will persist.

Such studies have been conducted at the Kerrville, Tex., laboratory during the last six years. This work has been carried out through the cooperation of entomologists, veterinarians, and chemists of the Agricultural Research Service.

Studies were conducted to determine whether insecticides used on livestock or on pasture and forage crops will contaminate the meat or milk, and if residues are produced how long they will persist.

Single spray treatments of DDT, TDE, and methoxychlor applied at 0.5-percent concentration to beef cattle caused storage of the insecticide in the fat. Lindane at a concentration of 0.03-percent could not be detected.

Multiple spray treatments with lindane and methoxychlor at 3-week intervals caused no greater storage in the fat than a single treatment. Multiple treatments with other chlorinated hydrocarbon insecticides—chlor-dane, DDT, dieldrin, heptachlor, methoxychlor, TDE, Strobane, and toxaphene—at 2- or 3-week intervals resulted in slight to moderate increases in the amount of storage. A 0.5-percent malathion spray applied at weekly intervals caused no storage in the fat.

Test Chrysanthemumic Esters

In an attempt to synthesize half of the sesamin molecule, chemists at the Beltsville, Md., laboratory prepared 1-(3,4-methylene-dioxyphenyl)-4-chlorobutanol. Attempts to cyclize this to the corresponding furan compound always resulted in the formation of the unsaturated compound *alpha*-allylpiperonyl alcohol. The acetate of this piperonyl alcohol was subjected to routine screening tests and was found to have considerable merit as a synergist for pyrethrins.

Tests for other possible synergists for pyrethrins and allethrin, other derivatives of *alpha*-allylpiperonyl alcohol were made. The derivative most effective as a synergist was the ester with *cis-trans*-chrysanthemumic acid. A systematic study was then made of other esters of chrysanthemumic acid.

Results of several studies showed the efficacy of the 3,4-methylene-dioxyphenyl group in synergistic activity. Surprisingly, some of the esters in this group showed a significant larvicidal activity. The effect

against body lice was almost as uniform as that against mosquito larvae.

Only a few esters of alcohols other than the piperonyl alcohols showed promise in this series. They included the benzyl, cuminyl, cinnamyl, *o*-methoxybenzyl, *p*-methoxybenzyl, *o*-veratryl, *o*-chlorobenzyl, *p*-chlorobenzyl, and 3,4 dichlorobenzyl esters. Only the *o*-veratryl and *o*-chlorobenzyl esters had much action against body lice.

Screening Tests of Esters of Chrysanthemic Acid as Synergists and Insecticides, by Yuh-Lin Chen and W. F. Barthel. ARS-33-23, June 1956, United States Department of Agriculture, Agricultural Research Service.

Herbicide Showing Promise

"Baron" a new residual, non-selective systemic herbicide recently developed by the Dow Chemical Co., Midland, Mich., has been reported to show promising results in laboratory and field tests by Dow research workers. The new product is an emulsifiable formulation containing technical erbon, 2-(2,4,5-trichlorophenoxy) ethyl 2,2-dichloropropionate.

Optimum results are obtained with Baron if sufficient rain falls after the application to leach the chemical into the root zone, though a considerable degree of control is effected even under drouth conditions where such leaching is impossible. The researchers describe effects noted on plants to include a slow foliage burn or gradual wilting, followed by yellowing and death to top growth. They recommend a dosage range for perennial grasses from 20 to 30 gallons per acre, and for some of the perennial herbaceous broadleaved weeds a dosage of up to 15 gallons was discovered to be effective.

Residual control of encroaching vegetation and prevention of seedling germination from Baron persistent in the soil reportedly can be expected for periods of several months to a year or more. The researchers warn that excessive spray drift of the herbicide may cause damage to nearby vegetation, though the low amounts utilized generally make volatility and drift hazards negligible.

Antibiotic Fungus Control

Recent greenhouse tests have shown that anisomycin, Mycostatin (fungicidin), oligomycin, griseofulvin, and Filipin protected beans and lima beans from one or more of the four diseases against which they were tested. Bean and lima bean seedlings were sprayed with aqueous solutions or suspensions of the antibiotics, and 24 hours later inoculated with spore suspensions of the several fungi. The inoculated plants were placed in a fog chamber for 12 to 48 hours, depending upon the pathogen used, and later in an open greenhouse.

Anisomycin protected beans from rust, and lima beans from downy mildew. Mycostatin protected beans from anthracnose and gave partial protection against bean rust. Oligo-

mycin protected lima beans from downy mildew and stem anthracnose, and beans from rust and bean anthracnose. Griseofulvin protected beans from rust, whereas Filipin protected lima beans from downy mildew, and partially protected against bean anthracnose; both were ineffective against infection from other fungi. Rimocycin failed to protect beans and lima beans from infection by any of the pathogens tested. Anisomycin was the only antibiotic that eradicated bean rust, but it did not do so completely.

"Control of Several Fungus Diseases of Beans and Lima Beans with Antibiotics," by W. J. Zaumeyer and R. E. Wester. A paper presented at the March meeting of the Potomac Division of the American Phytopathological Society.

NEW BOOKS

Insect Pests of Farm, Garden, and Orchard, Fifth Edition, by the late Leonard Marion Peairs and Ralph Howard Davidson. Published by John Wiley & Sons, Inc., New York, and Chapman & Hall, Ltd., London. 660 pages, \$8.50.

It's good for the industry and for the agricultural research field that books like this are repeated in later editions. This new edition of *Insect Pests*, a rewriting and a bringing up-to-date of the 1941 edition, was made necessary by the number of new findings and observations by entomologists and other researchers in the past 15 years; and, although aimed primarily to serve as a college textbook, it will be welcomed by the agricultural research as well. The volume is well illustrated and organized, and may well be used as a handbook for county agricultural agents and extension specialists.

In addition to the rewriting, there have been a number of other important changes over the fourth edition. The discussion on structure and development of insects was expanded; the chapter on classification was enlarged to include more about the animal kingdom to help bridge the gap for students who do not enroll in general zoology courses, and

there was an enlargement of the chapter devoted to chemical control. In addition, there are new chapters on insecticide formulations, spray mixtures, application equipment, dilution tables, and other pertinent chemical data.

Diseases of Fruit Crops, by H. Warren Anderson. Published by the McGraw-Hill Book Co., New York. 501 pages, price \$8.50.

This is a book of considerable interest to entomologists, agronomists, and other research workers as well as to practicing horticulturists and college instructors.

Mr. Anderson, professor of plant pathology at the University of Illinois, presents the diseases in the order of the crops on which they occur, with the diseases of each crop being treated in the order of their importance. He also brings up to date recent advances in plant pathology, such as those connected with virus diseases, nematodes, etc. The well-chosen illustrations show symptoms of the diseases rather than morphological details of the organisms causing them.

As the book's flyleaf points out, it brings together a wealth of material available previously in widely scattered bulletins, circulars, and scientific articles. The book seems to fill a definite need in the field.



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INDUSTRY News

Hastings to Shell NH₃ Div.

Stephen J. Hastings has been appointed assistant sales manager of the Ammonia Division of the Shell Chemical Co., New York, and will make his headquarters at the company's San Francisco office. Mr. Hastings had been assistant to the sales manager of Shell's Agricultural Chemical Sales Division in New York.

Joining Shell Oil in 1947, he became a technical salesman at the Cleveland office of Shell Chemicals in 1949. From 1953 to 1955 he was N. Y. district manager in agricultural chemical sales. Mr. Hastings will be succeeded as assistant to the sales manager, agricultural chemicals, in New York, by L. F. Allen, former supervisor of Shell's advertising department.

Haddock to New Diamond Post

Bruce L. Haddock was appointed to the newly created position of assistant merchandising manager of Diamond Black Leaf Co., Cleveland, in an announcement Sept. 28th.

Mr. Haddock will assist Clark M. Munger, merchandising manager in furthering the company's distributor dealer program of Black Leaf brand home-gardening chemicals.

Chemicals Featured at Fair

Crop dusters and agricultural chemicals came in for a good share of the attention in the Contra Costa County exhibit at the California State Fair at Sacramento, Aug. 29-Sept. 9. A large model of a crop-dusting plane was shown laying a dust cloud, over a foreground showing the crops grown in the county. Under the plane were shown the various agricultural chemicals used. The exhibit, which won an award for county feature horticultural products,

was prepared under the direction of A. L. Seeley, Contra Costa County agricultural commissioner.

Monsanto Sales Reorganized

The Monsanto Chemical Co., St. Louis, has announced the organization of separate sales sections for agricultural and for industrial chemicals in its Inorganic Chemicals Division.

In the agricultural sales section, S. R. Clement has been appointed director of sales and Leroy Donald director of sales development, both with offices in St. Louis. Two assistant directors of agricultural sales were appointed also: Bernard Machen, in charge of district offices, and R. W. Goldthwaite, in charge of agricultural products. M. F. Walsh was appointed manager of product sales and Roy Spence manager for direct application of ammonia products.

Buckeye Plant to Be Sold

The Buckeye Sugar Co., a fertilizer plant at Ottawa, Ohio, was placed on sale last month by Karr & Co., Columbus, Ohio. The plant is a fully-equipped installation on the DT&I railroad, with 12,500 sq. ft. of floor space. It is a dry mix plant with a minimum capacity of 10,000 tons per year, and in 1954 did a reported gross business of \$634,959.

Calspray Leases Ariz. Plant

California Spray-Chemical Corp., Richmond, Calif., recently completed an agreement to lease the entire agricultural distribution facilities of Fannin's Gas and Equipment Co., in Phoenix, Ariz., effective Oct. 1. Calspray's district headquarters and warehouse will be moved to the Fannin facilities at 3107 Grand.

The company reports that the combined facilities would include

more than 1000 portable NH₃ field tanks, 200 trailers with mounted tanks, and dozens of storage tanks in Phoenix, Casa Grande, Buckeye, Mesa, and other Arizona locations.

Magcobar Opens New Plant



Magnet Cove Barium Corp., one of the Dresser Industries, recently began operations at its new Attapulgit Fuller's earth plant at Hinson, Florida to mine and process "Carriclay" and "Pulgite" two new insecticide

carriers. The new products will be marketed through the company's recently-formed industrial sales department, under the direction of George H. Moore, formerly general sales manager of Magnet Cove's drilling mud department. Robert L. Snook (pictured), who was previously with Acock Laboratories, Ltd., and Agricultural Chemicals, Inc., has been named Mr. Moore's assistant as an agricultural chemical specialist.

The new plant, still under construction, will produce a complete line of Attapulgit clays for use in a variety of insecticide concentrates and wettable powders. Since start of production in July the plant's drying capacity has been doubled. These products, in addition to Bentonite, Barite, and other natural clays, give the company a complete line of inert clays for the agricultural chemicals industry.

"Rival World" Previewed

"The Rival World," a new color-film produced by the Shell Chemical Corp., New York, was given a special New York preview Oct. 2 at the St. Regis Hotel. A large group of manufacturers, dealers, and trade magazine representatives attended.

The film is a documentary and contains many close-up shots of insects' destructive work against man. It describes pictorially the broad scientific war man is waging against the insect world, and will be shown throughout the country to acquaint the general public with the importance, and some of the problems, of insect control.

Shell reports that its camera crews had to travel to several continents to get footage for the film, which lists the principal strengths of the insect world as: "numbers, reproductive powers, weapons, and appetite." The narrator points out that "insects steal one-third of all the food man grows."

Agriform to be Liquidated

The Agriform Co., Inc., of Bakersfield, Calif. will be liquidated and succeeded by four new and separate independent corporations, John C. Anderson, Agriform president, announced recently. The company had been the largest independent liquid fertilizer manufacturer in California.

The announcement says that each of the new corporations will buy a part of the total physical assets of the original corporation and continue in business. The new corporations are: Agriform Co. of Imperial Valley, Inc.; Agriform Co. of Kern County, Inc.; Agriform Co. of Corcoran, Inc.; and Agriform Co. of Northern California, Inc.

Announce Chemical Clinic

Carter L. Burgess, assistant secretary of defense, will be the featured speaker at the fifth annual chemical sales clinic at the Commodore Hotel, New York, Oct. 15. The clinic is sponsored by the Salesmen's Association of the American Chemical Industry.

Southern Fertility Conference

The first annual Southern Soil Fertility Conference, sponsored jointly by the Southern Regional Soil Research Committee and the National Plant Food Institute, has been announced for Nov. 2 at the Atlanta Biltmore Hotel, Atlanta, Ga. Among the speakers scheduled are L. E. Nelson, head of the Eastern Soil and Water Management Section, USDA; M. S. Williams, chief agricultural economist, National Plant Food Institute; and a number of leading research experts from colleges in the Southeast.

V-C to Drop Textile Bags

Virginia-Carolina Chemical Corp., Richmond, Va., was scheduled to close its bag plant at Richmond and withdraw from the textile bag field. The company cited a steady customer preference for the multi-wall paper bags as the reason behind its move, pointing out that it has had to decrease its employees at the plant

from 250 during World War II to 31 at present. Virginia-Carolina entered the multi-wall field in 1949, opening a plant in Atlanta.

Naugatuck Names Steinen



The Naugatuck Chemical division of United States Rubber Co., Naugatuck, Conn., announced recently the appointment of Otto P. Steinen as assistant sales manager of agricultural chemicals.

Mr. Steinen, who had been technical representative for the Los Angeles area, joined the company in 1947.

At the same time, the company announced that Warren Newall, technical sales representative in the Portland, Ore., area, has been transferred to Los Angeles to fill the post vacated by Mr. Steinen. John T. Coke, formerly with the General Chemical Division of Allied Chemical and Dye Corp., was appointed new representative in the Portland area.

O-M Opens Texas Office

New offices for the Southwestern district of the Plant Food Division, Olin Mathieson Chemical Corp., were established last month at 4520 Clinton Drive, Houston 20, Texas. The new offices connect with the southern warehouse, a shipping facility for the company's fertilizers.

Flintkote Buys U. S. Lime

The Flintkote Co., Los Angeles, announced last month that it has acquired United States Lime Products Corp., of Los Angeles. The lime company, which has an annual sales figure of \$5 million, was acquired through purchase of 98% of its stock, for an undisclosed sum. U. S. Lime has quarries in Nevada, Arizona, and California, crushing plants and manufacturing facilities for various grades of agricultural and industrial lime. It will continue to operate as a division of Flintkote.

Smith-Douglass Moves

The Smith-Douglass Co., Norfolk, Va., recently moved into a new home office at 5100 Virginia Beach Blvd., just outside Norfolk. The new executive offices will house the parent Smith-Douglass Co. and the Coronet and Smith-Rowland divisions.

ESA in Eastern Meet

The annual meeting of the Eastern Branch, Entomological Society of America, was recently announced for Nov. 19-20 at Hotel Haddon Hall, Atlantic City, N. J. Feature of the meeting will be a symposium entitled "Review of Current Mite Problems" with P. J. Chapman as moderator and Phillip Garman, D. A. Chant, Floyd F. Smith, Henry S. Fuller, Edward W. Baker, George W. Wharton, and Ralph E. Heal or Philip J. Spear as speakers. Other planned features include discussions of current physiological research as related to economic entomology, talks on current pest control problems in the Northeast, and an evening discussion on insects that attack shrubs and ornamental plants.

Breidenbach to New Post

Commercial Solvents Corp., New York, has announced a major expansion of its agricultural chemicals sales and customer service for the 1956-57 fertilizer season. R. W. Breidenbach was named Midwest sales manager to direct the expanded effort from CSC's district office in St. Louis. He had been the firm's assistant general manager of agricultural chemicals sales in New York, where he directed the \$20 million expansion of nitrogen fertilizer facilities completed by the company in 1953. Prior to joining the agricultural chemicals department, he was manager of the San Francisco district office.

Raymond Bag Names Three

The Raymond Bag Corp., Middletown, Ohio, Multiwall Bag Division of Albemarle Paper Manufacturing Co., has announced three new appointments. T. H. Bacon was named assistant sales manager, C. W. Ingham, director of research and development, and E. H. Pyle to the post of packaging engineer.

The announcement also listed D. F. Wicks as Eastern district sales manager in New York; T. B. Athey, Mid-Atlantic sales manager in Baltimore; S. G. Shetter, Central district sales manager in Middletown, Ohio; and R. W. Drury, Jr., Western district sales manager in Kansas City.

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W. R. Grace Names Geiger



W. R. Grace & Co., New York, recently elected Marlin G. Geiger executive vice-president in charge of the chemical group composed of the company's seven chemical divisions. He will be succeeded as president

of the Davison Chemical Co. Division by William E. McGuirk, Jr., formerly Davison's executive vice president.

As chemical group executive, Mr. Geiger assumes duties formerly assigned to Hugh S. Ferguson, Grace executive vice-president, who became a member of the management group. At the same time, Dr. Charles E. Waring, formerly Davison vice-president in charge of research and development, was named vice president of Grace Chemical Research and Development Co. Division, and will also serve as a vice-president of the parent company.

List 5 Nitrogen Solutions

The Nitrogen Division of Allied Chemical & Dye Corp., New York, recently announced production of five new concentrated nitrogen solutions which it reports will give fertilizer manufacturers substantial savings on freight costs. Most of the new solutions contain less water than those currently available, and which, the company explains, will permit freight savings of up to 7%, and will also permit manufacturers to produce better quality fertilizers. One of the new solutions is reportedly the first ever available designed specifically for making granular fertilizers and which also can be used all year round because of its low salting-out temperature.

In addition to "Nitrana" type solutions, there are included two new "Urana" type solutions, giving flexibility to those manufacturers producing semi-granular and organic nitrogen fertilizer grades.

Butz MWSIC Speaker

Earl L. Butz, assistant secretary of agriculture, will be the featured speaker at the annual meeting Oct. 25 of the Middle West Soil Improvement Committee at the Sherman Hotel, Chicago. He will speak on "The Implications of the Soil Bank to the Fertilizer Industry."

The MWSIC business meeting is scheduled to include reports on the results of the committee's 1955-56

educational program and a discussion of plans formulated for the coming year's activities.

Hose Safety Stressed

The American Cyanamid Co., New York, recently issued a warning on faulty safety practices while unloading anhydrous ammonia from tank cars. Cyanamid discovered that some of its customers were using one-inch approved unloading hose on tank cars equipped with two-inch liquid valves and two-inch liquid excess flow valves.

Cyanamid's engineering department, to alert users to possible injury or damage which might result from hose failure, has issued the following recommendation:

"To insure that the two-inch liquid excess flow valves close, under all conditions, it is necessary to use two-inch hose to unload the ammonia from the tank cars to the customers tanks. If a smaller size hose is used, in all possibility, the excess flow valves will not close in the event of a hose failure."

St. Regis Expands in Texas

The St. Regis Paper Co., New York, in an expansion of its Multi-wall Packaging Division sales facilities in Texas, recently announced the opening of a new sales office in Amarillo, and the move of its Dallas office to larger quarters at 6923 Snider Plaza, Dallas 5. Reid H. Williams, formerly in the Dallas office, was named manager of the new Amarillo office.

Elect Sears To V-C Board

Paul B. Sears, professor of conservation at Yale University and president of the American Association for the Advancement of Science, was recently elected to the board of directors of Virginia-Carolina Chemical Corp., Richmond, Va. A botanist and conservationist, Dr. Sears has been chairman of the university's conservation program since it was established in 1950 as one of the country's first graduate programs of research and instruction in the conservation of natural resources.

Name Lutz to Chemagro



Dr. Albert W. Lutz, formerly associate professor of chemistry at the College of William and Mary, Williamsburg, Va., was recently appointed to the research staff of the Chemagro Corp., Pittsburgh. He received his doctorate in organic chemistry from Johns Hopkins University in 1953.

V-C Appoints Gillette

Walter B. Gillette has been named to the newly-created position of sales manager for the Bag Division of Virginia-Carolina Chemical Corp., Richmond. He will make his headquarters at the firm's New York office. Mr. Gillette had been in charge of bag sales in New York, and prior to that was office manager of the division's Richmond office.

Live Wheat Damage Denied

Rumors about infestations of grain-infesting insects in wheat before it is harvested were discounted last month by researchers at the Kansas State College, Manhattan, Kan. A State College survey reports that such conditions are rare, and examination of uncut wheat in 34 Kansas counties during late June did not reveal any grain-infesting insects.

Donald A. Wilbur, entomologist at Kansas State, says that in some years insects such as the cowpea curculio and the wheathead armyworm damage developing kernels in such a way that the damage appears to have been caused by internal feeding insects. None of these insects was observed in the June survey, though many collections contained large numbers of bark lice, which may prove to be the same species found in stored grain.

Dow Plans Expansion

Dow Chemical Co., Midland, Mich., has announced a \$75 million expansion program for the fiscal year ending next May 31. Now under way, some of the expansion will further decentralize the company's operations and increase facilities for some of Dow's basic chemicals.

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Aerial Dusting Conference

The eighth annual Aerial Dusting and Spraying Conference will be held Oct. 30-31 at the Marcus Whitman Hotel, Walla Walla, Washington.

It will be sponsored by the Institute of Agricultural Sciences of the State College of Washington. Among the featured speakers will be C. O. Barnard, executive secretary of the Western Agricultural Chemicals Association, who will speak on "Safe Handling and Effective Application of Pesticides."

Phosphate Output Off

July production of superphosphate and other phosphatic fertilizers was 19% less than the June output, the U.S.D.A. reports. Production figures for the month amounted to 136,635 short tons. However, shipments of phosphatic fertilizers were 17% over the previous month's volume.

Mexican Spray Campaign

Mexico last month began a five-year multi-million dollar spray campaign to eradicate malaria. President Adolfo Ruiz Cortines gave the starting signal, at special palace ceremonies Sept. 7, to begin an intensive house-to-house spraying campaign involving the spraying every six months of 700,000 houses and buildings.

Agreements for the campaign were signed last December by Mexico, the World Health Organization, the U. S. International Cooperation Administration, and the United Nations Children's Emergency Fund. Mexico is putting up \$12 million in salaries and administration and the Children's Fund is providing \$8.4 million in jeeps, spray guns, insecticide and other equipment. World health officials estimate that Mexico has the worst malaria record in the Western Hemisphere, with a death toll estimated at 23,000 yearly, plus an annual figure of 2 million infected persons.

Backbone of the present campaign are 400 jeep-equipped spraying brigades, working out of fourteen malaria campaign zone headquarters.

The World Health Organization reports that Brazil, El Salvador,

Guatemala, Haiti, Honduras, and the Dominican Republic are also planning, or have already begun extensive malaria control measures. As of June 1 only the U. S. and Chile had completed their campaigns. Canada and Uruguay have had no malarial incidence.

Bemis Appoints Weeks



A.N. Weeks, formerly manager of the multiwall paper bag plant at East Pepperell, Mass., has been appointed director of production of the Bemis Bro. Bag Co., St. Louis. He will succeed A.H. Clarke, who will

continue as a vice-president and director of the company.

Mr. Weeks, who joined Bemis in 1919, had been manager of the East Pepperell plant since 1938. He will be succeeded in that post by F. G. Bemis, Jr.

Appoint Zigler Gen. Mgr.

John D. Zigler has been appointed general manager of the Plant Food Division of International Minerals & Chemical Corp., Chicago. He had been operating manager of the division, supervising sales and production at its 26 fertilizer plants.

Mr. Zigler joined the company 23 years ago, climbing progressively to assistant district manager, district manager, and area manager before becoming operating manager of the Plant Food Division.

Brooks To Penick Post

Ivan C. Brooks was recently named a research entomologist on the research staff of S. B. Penick & Co., New York, and will work in the firm's agricultural chemicals and pesticides unit. From 1950 to 1956 he was in charge of entomological work for Diversey Corp., Chicago.

Spray Planes Fighting Fire

Seven crop-dusting planes were used to help conquer the San Bernardino-Lake Arrowhead forest fire in California in late September. The planes, each carrying a load of from 80 to 120 gallons of water, were used to "water-bomb" impenetrable hot areas of the fire, which swept more than 10,000 acres of forest land.

Intensify Medfly Program

A contract for additional aerial sprayings of some 40,000 acres in the Miami area was signed recently by the USDA with the United-Heckathorn Co. Additional detection traps have been brought into the State of Florida as the USDA stepped up its campaign against the Mediterranean fruit fly. The Department reports that the search for the fly will be extended to ports on the Gulf of Mexico, South Atlantic coast, Mexican border, and as far away as Puerto Rico and the Virgin Islands.

The report indicates the success of the campaign in the three trouble counties, Dade, Broward, and Palm Beach. Between the fifth and sixth sprayings, some 1300 traps in Miami caught about one fly per 100 trap-days, compared to 300 flies caught per 100 trap-days before the first spraying. However, adult flies were recovered in traps at 20 locations in the Miami area following the fifth spraying.

Since its discovery in Florida April 13, the fly has been found in 27 counties, seven of them under Federal quarantine. In lightly infested areas not under Federal control, movement of products is being regulated by the State of Florida.

Aviation Group to Meet

The 17th annual convention of the National Aviation Trades Association has been announced for Nov. 1-3 at the Chase and Park Plaza Hotels in St. Louis, Missouri. The program includes a number of subjects on air application, with a special section to be devoted to problems of air applicators.

At 10 a.m. on Nov. 1 air applicators will meet on the proposed Air Agency idea, and will discuss problems of cost analysis and other matters. On Nov. 2, they will hear from the USDA and the CAA on Federal Contracts, and later in the day will discuss "Agricultural Aviation Research and Development in USDA." On the last day of the conference the applicators will present a summary of their findings to a general meeting of the NATA.

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Experienced producer of petroleum products for 66 years, Standard Oil now turns this production know-how and research experience to the manufacture of Anhydrous Ammonia, Aqua Ammonia and Nitrogen Solutions. You can be sure of Standard Oil as a dependable source of supply. New, modern chemical laboratories assure you of exacting quality control.

2

Convenient manufacturing plant location at Hammond, Indiana in the heart of Mid-America is an ideal shipping point. Plant is adjacent to the nation's largest rail and truck center, permitting the greatest possible flexibility of shipment routing for speed and for *your* convenience.

3

Storage facilities. Extensive storage for Anhydrous Ammonia, Aqua Ammonia and Nitrogen Solutions are a part of the facilities of the plant. You are thus assured of immediate availability and the immediate filling and shipping of *your* order.

4

Shipping facilities. Fleets of tank cars and tank trucks are ready to deliver Anhydrous Ammonia, Aqua Ammonia and Nitrogen Solutions to you. Plant-side trackage permits positioning cars for immediate filling and shipment of *your* order.

5

Simplified ordering. As a Midwest manufacturer, chances are you are already a Standard Oil customer for fuels and lubricants. You may thus have an established purchasing continuity with Standard. You may order Anhydrous Ammonia, Aqua Ammonia and Nitrogen Solutions just as easily as you order your petroleum products—and in the same way. Call your nearby Standard Oil office. Teletype facilities or direct phone line will be used to start *your* order moving.

6

Designed to fit every need. Standard offers four Nitrogen Solutions, both Commercial and Refrigeration grade Anhydrous Ammonia and Aqua Ammonia. Nitrogen Solutions are:

Nitrogen Solution 410A (41.0% total nitrogen)
Nitrogen Solution 410B (41.0% total nitrogen)
Nitrogen Solution 370 (37.0% total nitrogen)
Nitrogen Solution 490 (49.0% total nitrogen)



Find out more about the advantages of ordering Standard Anhydrous Ammonia, Aqua Ammonia and Nitrogen Solutions. Get a copy of this new booklet describing the full line of nitrogen products. In the Midwest, call your nearby Standard Oil office. Or write, Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY
(Indiana)



Chemagro to Build New Plant

Chemagro Corp., New York, last month announced plans to build a new \$2 million insecticide manufacturing plant in Kansas City. Ground breaking for the new plant, which will be located on a 25-acre site purchased from the Kansas City Southern Railway, is scheduled for this month.

The installation will include a formulation plant, a laboratory, warehouse, administration building, and a production unit for the manufacture of the organic phosphate insecticide guthion. The announcement says that a pilot plant will be in operation sometime next year.

TVA Liquid Fertilizers

TVA announced last month that it is producing liquid fertilizers on an experimental basis and on a pilot-plant scale. Productive capacity is about 10 gallons an hour and the entire output is being used in tests and experiments.

TVA said that of the liquids undergoing tests, "superphosphoric acid," appears to have unusual possibilities. It is between 40 and 50 percent more concentrated than the phosphoric acid commonly being produced for fertilizer or chemical use. The superphosphoric acid will make a liquid fertilizer containing considerably more plant food than the usual liquid mixture; liquid fertilizer containing 12 percent nitrogen and 36 percent phosphate — a total plant food content of 48 percent — can be made with superphosphoric acid. The comparable grade now on the market contains 8 percent nitrogen and 24 percent phosphate. Another important thing about the superphosphoric acid, TVA said, is that due to its higher concentration shipping costs for the strong acid would be substantially less than for phosphoric acid commonly in use.

Another liquid concentrate of interest to TVA is made with ammonium metaphosphate, a new TVA fertilizer. The solid ammonium metaphosphate is 90 percent plant food, but it is difficult to produce in solid form. Experiments show it can be

made in solution form more easily and that the resulting liquid is not only concentrated but also stable at low temperatures. Solutions of ammonium metaphosphate contain as much as 52 percent of combined nitrogen and phosphate plant food.

Pacific Borax Appointments

The Pacific Coast Borax Co., Division of United States Borax &



L. L. Fusby



R. W. Hinchman

Chemical Corp., New York, last month announced the appointment of Lloyd L. Fusby as Western manager, and of Roger W. Hinchman as general sales manager. Mr. Fusby will continue to make his headquarters in Los Angeles and Mr. Hinchman will remain at the division's headquarters in New York.

Mr. Fusby, a chemical engineer, had been superintendent of the Boron Plant and production manager, and will assume over-all responsibility for production at both Wilmington and Boron, in addition to the related activities of the division. Mr. Hinchman, who will take over the division's Industrial and Agricultural Departments, had been with the company since 1941.

Thanite for Mosquitoes

In a new folder on its insect toxicant "thanite," the Agricultural Chemicals Division, of Hercules Powder Co., Wilmington, describes uses of the toxicant in various aerosol fog generators and mist machines for mosquito control. According to the folder, thanite's low oral toxicity, heat stability, cost, masking odor, and relatively low human irritation make it well suited for aerosol dispersion. The folder also discusses use of the toxicant in oil sprays, water emulsion sprays, and gives a knockdown rating of its toxic effects on the *Culex pipiens* mosquito.

Nitrogen Assn. Meeting Set

The annual meeting and trade show of the National Nitrogen Solutions Association has been announced for Oct. 16-17 at the Sioux City Auditorium, Sioux City, Iowa. Among the scheduled speakers are Dr. Raoul Allstetter, vice president of the National Plant Food Institute, who will review "Production of Fertilizer Nitrogen;" John D. Waugh, Nitrogen Division of Allied Chemical & Dye Corp. who is to report on the "Effective Use of Advertising;" and A. V. Slack, Tennessee Valley Authority scheduled to discuss "Liquid Complete Fertilizers."

Each of the principal talks will be followed by a dealer panel discussion; comments on the place of nitrogen in the fertilization of mid-western crops are scheduled for Oct. 17. Exhibits will be open from 9 a.m. to 5 p.m. on both days.

Name Fletcher Sales Rep.

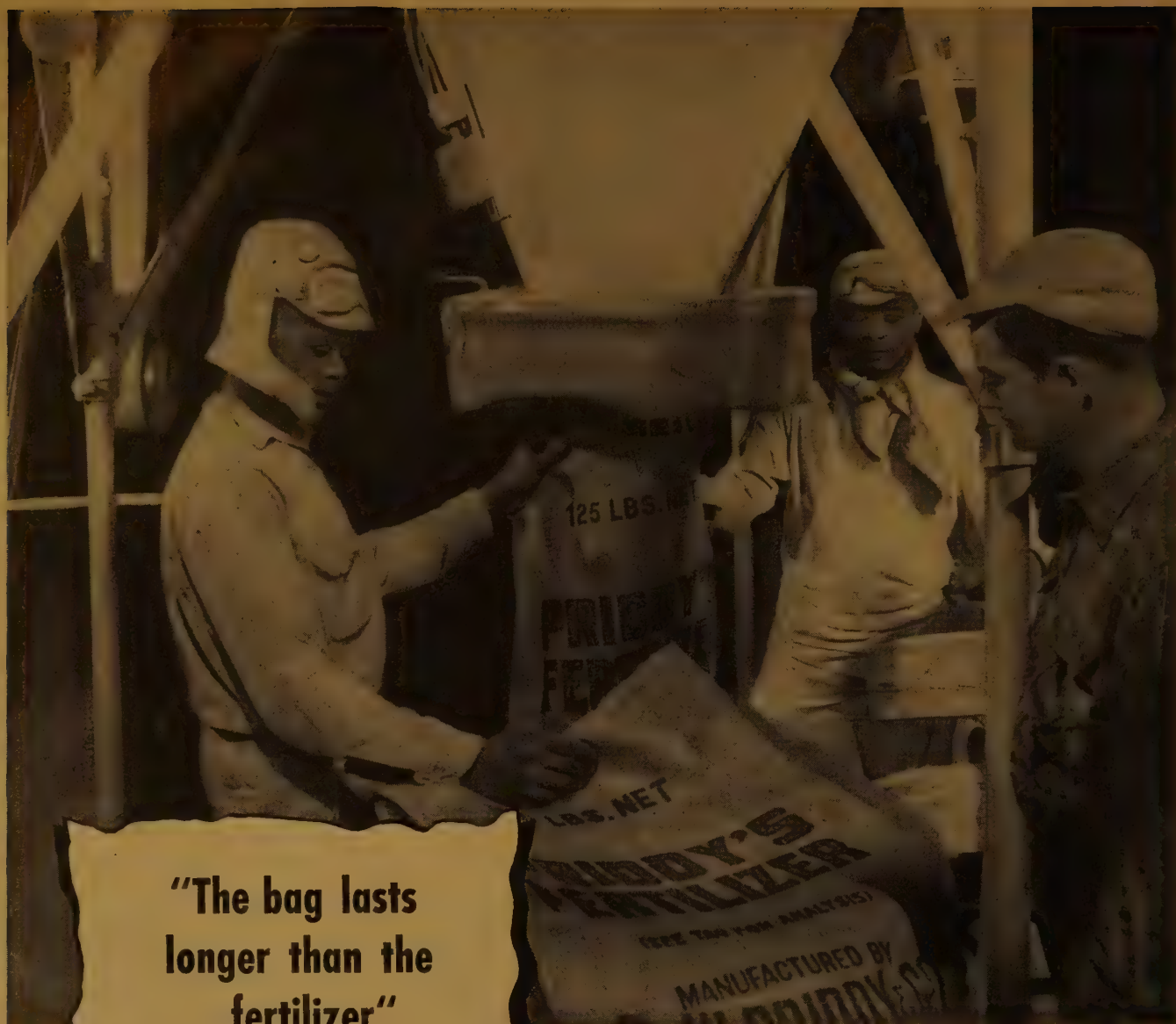
The American Chemical Paint Co., Ambler, Pa., has appointed J. Charles Fletcher sales representative of the Agricultural Chemicals Division for Mississippi, Arkansas, and Louisiana, with headquarters at Jackson, Miss. He succeeds Dan Chisholm, who was appointed sales supervisor of the company's Southern Division.

Announce Hall Retirement

Chipman Chemical Co., Inc., Bound Brook, N. J., recently announced the retirement of William F. Hall, sales manager of its agricultural division. He had been with the company for 26 years. The company announced that Blanchard J. Smith, vice-president in charge of sales, would assume Mr. Hall's duties.

Name Two in Research

Dr. James V. Kerrigan and Dr. Lothar E. Geipel have joined the Stauffer Chemical Co., New York, as research chemists. Both will be located at Stauffer's Richmond Research Laboratory, Richmond, Calif. Prior to joining Stauffer, Dr. Kerrigan was associated with the Ames Laboratory of the Atomic Energy Commission.



"The bag lasts longer than the fertilizer"

says Sydnor Y. Priddy, president of Charles W. Priddy & Co., fertilizer manufacturers of Norfolk, Virginia. "Farmers want their fertilizer in burlap so they can use the bags to pack their own produce after they've used the fertilizer. Burlap bags have more uses around a farm than you can name.

"We know that burlap is safer for shipping fertilizer than any other kind of bag. No matter how they go—by train or truck, they won't chafe, break or tear."

Pack your fertilizer in burlap bags for easier handling in the plant and better protection during shipping. Use "bag appeal" to sell more fertilizer to farmers in your area.

**Just ask your own customers—
they'll tell you that burlap**



Is strong—takes dragging, dropping, man-handling—any tough job on the farm.



Gives good ventilation—keeps farm supplies and products fresh.



Laughs at sudden showers—wetness or dampness can't weaken it.



Saves money—extra value from re-sale and re-use.



Saves storage space—stacks to any height without slipping.



Has 1000 uses—always in demand on the farm (popular with farm wives, too!)

THE BURLAP COUNCIL

of the Indian Jute Mills Association

155 East 44th Street, New York 17, N. Y.

Cyanamid Names Wellman

Dr. V. E. Wellman has been named manager of the petrochemicals department of the Organic Chemicals Division of American Cyanamid Co., New York. Prior to joining the company in 1945, he was associated with the B. F. Goodrich Co., Cleveland, and R. W. Greeff Co., New York.

Dow Appoints 2 Field Men

Paul Ritty and Mark Norris, field specialists in agricultural chemical development for the Dow Chemical Co., Midland, Mich., recently assumed new duties. Mr. Ritty will work on vegetation and plant growth control projects in Florida, Georgia, and the Carolinas. Mr. Norris will work on projects on veterinary chemicals and animal nutrition, operating from the Dow Agricultural Research Center at Lake Jackson, Texas.

Kansas Research Expanded

Basic research using some \$45,000 a year is being conducted by the Kansas Agricultural Experiment Station under Dr. Clifford C. Roan of the Kansas State College entomology department, it was announced last month from the station at Manhattan, Kansas.

Money for the different projects includes \$8,300, from the Atomic Energy Commission; \$5,500 from the Dow Chemical Co.; \$15,870 from the U. S. Public Health Service; \$8,662 from the Department of Army; \$2,000 from Frontier Chemical Co.; North-Central regional funds amounting to \$5,000; and \$3,000 from the agricultural experiment station.

Under two of the projects, Dr. Roan and Kansas State scientists are using radioactive tracers to label Dow ET-57, a systemic phosphate chemical. The Public Health Service funds are to finance study of the specific way phosphorus insecticides act in insects and higher animals. The Kansas State department of entomology is also conducting a special research project on the action of grain fumigants and their effects on stored grain insects. The project is being supported

by a \$2,000 grant from the Frontier Chemical Co., Wichita, to supplement another \$3,000 grant received earlier in the year. Doctors C. C. Roan and D. A. Wilbur are in charge of the project.

A-W Names W. W. Hoover



The Ashcraft-Wilkinson Co., Atlanta, sales agents for Duval Sulphur & Potash Co., have named Wendell W. Hoover, Jr. as sales representative in the Midwest. Prior to his joining the company, he was associated with the West Virginia Extension Service. He will make his headquarters in Columbus, Ohio, as assistant to Warren C. Huff, district manager.

IM&C Sales, Earnings, Up

International Minerals & Chemicals Corp., Chicago, has announced a 23% increase in net earnings for the fourth quarter of the year ending June 30 over the same period last year. Net sales of the corporation for the fourth quarter ending June 30 amounted to \$30,422,955, an increase of 12% over the \$27,096,753 listed for 1955. However, due to a strike in the corporation's Florida phosphate fields during the entire first quarter of the 1956 fiscal year, the company's net earnings fell from a 1955 figure of \$6,321,90, to \$5,401,723 this year.

Seed Authority Dead

Wilfred Hornsby Wright, Canadian authority on seeds and weeds and president of the North American Seed Treating Association, died last month. He had retired in 1950 as chief of laboratory services in the Canadian Federal Agriculture Dept. plant products division.

Cotton States ESA Meet. Feb. 4

The annual meeting of the Cotton States Branch of the Entomological Society of America will be held February 4-7, 1957 in Birmingham, Alabama. Program details will be announced later. The announcement was made by W. G. Eden, secretary-treasurer.

Zickl, of V-C Group, Dies

Rupert T. Zickl, leader of the Independent Stockholders Committee that took control of the Virginia-Carolina Chemical Corp. from president Joseph A. Howell, died September 25 after a long illness. He was a vice-president and director of the Bartram Brothers Corp., an estate management concern, and figured prominently in the reorganization of the Nickel Plate Railroad.

Mr. Zickl had been ill since shortly before the crucial V-C stockholders meeting in July, during which former governor of Virginia John Battle assumed control of the independent group. The independents scored a victory over Mr. Howell's administration, and in July replaced six of the firm's directors with six of their own group, also naming William C. Franklin as temporary president.

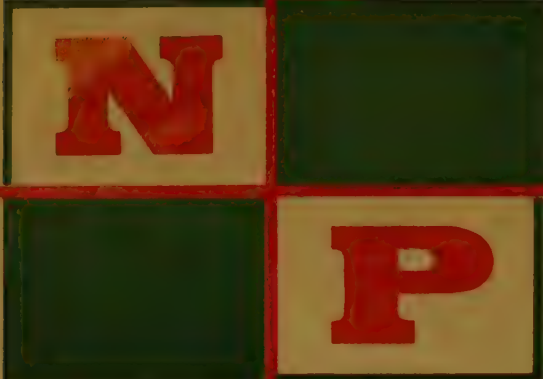
Mr. Zickl had acted as spokesman for the independent group since early this year, carrying on a running fight with Mr. Howell's group in the press and in the mails.

ASAE Plans Two Meetings

The American Society of Agricultural Engineers has announced plans for two separate meetings, one regional and the other national, in the next few months. The annual fall meeting of the Pacific Northwest Section of ASAE will this year be held Oct. 24-26 at Penticton, British Columbia. The annual winter meeting of the National Society of ASAE has been announced for Dec. 9-12 at the Edgewater Beach Hotel in Chicago.

India Plans Fertilizer Increase

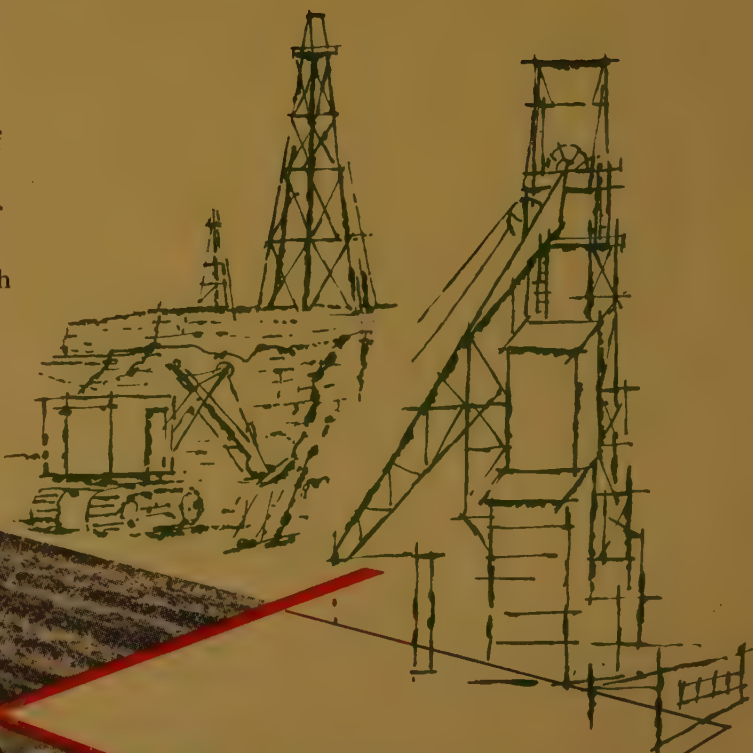
The Ministry for Production of the Indian Government, at New Delhi, has announced plans for a general rise in fertilizer production. The second five-year plan will have a target for fertilizer production of 380,000 tons of nitrogen, with requirements for the third estimated at 480,000 tons. At the same time the ministry announced that Burmah-Shell has withdrawn its offer to manufacture fertilizers from the gases at its Trombay Refinery.

**N****P**

a joint venture in Potash

A new, substantial and dependable source of potash for fertilizer manufacturers is being developed by National Potash Company in New Mexico.

National Potash is a joint undertaking of Pittsburgh Consolidation Coal Company and Freeport Sulphur Company. The former is one of the nation's major coal firms, the latter a leading producer of sulphur with additional interests in oil and other minerals. The skills which they bring to the mining, refining and marketing of potash assure top quality, uniformity and service.

**NATIONAL****POTASH COMPANY**

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CACA Program for October

D. K. Jackson, of Monsanto Canada Ltd., discussing "The Future Markets and Growth of Agricultural Chemicals in Canada," and Dr. H. Martin, director of the Science Service Laboratory, Dept. of Agriculture, presenting "A Long Term Evaluation of the Place of Insecticides in Crop Protection," will be among the featured speakers at the annual meeting of the Canadian Agricultural Chemicals Association. The meeting is scheduled for Oct. 16-18 at the Sheraton-Brock Hotel, Niagara Falls, Ont.

Also included in the program is a panel discussion on "Agricultural Extension" with A. H. Carter, Sherwin-Williams Co. of Canada Ltd., as chairman and a number of industry and research leaders as panel members. Final day of the three-day meeting will be devoted to four talks by Canadian farmers on important questions farmers are asking about agricultural chemicals.

Sinclair Names Peterson

Maurice E. Peterson recently joined Sinclair Chemicals, Inc., New York, as sales representative, Nitrogen Products Division. He will handle sales of anhydrous ammonia and nitrogen solutions from Sinclair's new plant at Hammond Ind. in Iowa, Minnesota, and neighboring states. His headquarters will be in Blencoe, Iowa.

Addresses Commissioners

Louis H. Wilson, secretary and director of information, National Plant Food Institute, told a meeting of the National Association of Commissioners, Secretaries and Directors of Agriculture September 21st, that "all of us have a stake in the future of agriculture and an opportunity, if not an obligation, to relate the improvements in agricultural technology, research, and farming progress to the fact that we have a higher standard of living today, thanks to the contributions of the American farmer."

He spoke on a panel on the subject of "Improving Public Relations

and Press Relationships Pertinent to Agricultural Regulatory and Service Functions," in connection with the Association's 38th annual convention in San Francisco.

Wilson emphasized that the Institute's "founding fathers" made one of the organization's basic objectives "to cooperate with the Fertilizer Control Officials in the several states in accomplishing a better understanding of the state fertilizer laws."

Fulton Bag Appoints Two

Fulton Bag & Cotton Mills, New Orleans, announced recently two appointments in its Kansas City branch. James R. Jones, formerly office manager of the Kansas City branch, has been appointed sales representative for the Kansas City area, northeastern Kansas, and northwestern Missouri. R. A. Euler was named sales representative for southern Kansas and southwestern Missouri.

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Whatever the job . . . filtering, straining or sizing . . . L-S Screens or Cloth will prove by comparison that their *greater resistance to wear, vibration, distortion, corrosion and heat* will cut replacement costs, downtime and maintenance. Hundreds of sizes and weaves can be shipped immediately from stock, or precision woven to your specification.

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DIAMOND insecticides and herbicides are known for dependable potency



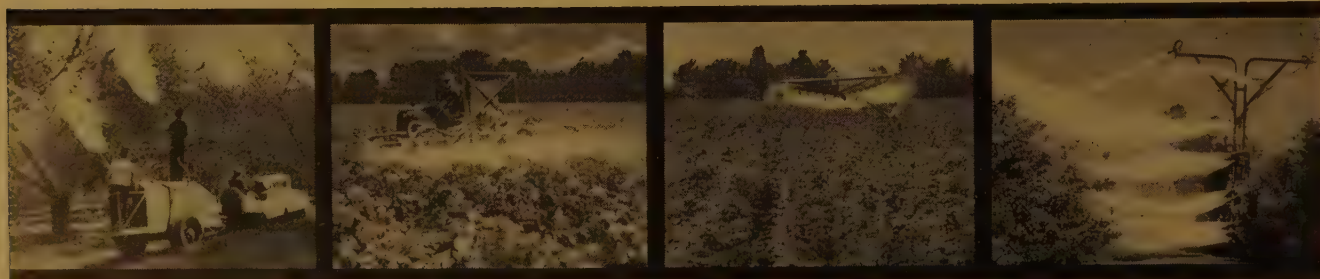
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sure of it here



Diamond's research and development center in Painesville, Ohio



So you can count on peak performance here



Write for literature on any of our products, and feel free to consult our technical staff when you have special problems. Your inquiries are welcome. DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.



**Diamond
Chemicals**

DIAMOND AGRICULTURAL CHEMICALS

- DDT
- BHC
- LINDANE
- MITICIDE K-101 (Ovex)
- Seed Disinfectant
- 2,4-D Weed Killers
- 2,4,5-T Brush Killers
- Grain Fumigants
- Wettable powders, emulsifiable and oil solutions; and dust concentrates based on our technical grade chemicals

and many other chemicals that help farmers, gardeners, cattlemen and orchardists.

Pyrenone Tolerances Set

A wide variety of fresh fruits, including tomatoes, that are to be processed, frozen, or canned, were recently given official tolerances by the Food and Drug Administration. The tolerances were set at eight parts piperonyl butoxide plus one part pyrethrins (or, from different treatments, four parts allethrin) per million parts of fruit. The tolerances announced provide for treatment, according to good agricultural practice, at harvest, during transportation, or prior to the processing operations at canneries for control of fruit flies and other insects.

The same tolerance level was also given official sanction for storages of peanuts, walnuts, almonds, cottonseed, flaxseed, oats, beans, peas, grain sorghum, copra, and cocoa beans; but does not change the previously approved higher level of 20 parts piperonyl butoxide and three parts pyrethrins for stored wheat, corn (and popcorn), rice, rye, barley, and buckwheat.

The announcement says that no tolerance is needed for the two substances in meat and milk, because no residues resulted from prolonged and repeated use of "pyrenone" sprays on beef and dairy cattle.

Spencer Profits, Sales Up

Spencer Chemical Co., Kansas City, last month reported that its sales and profits had hit new records in fiscal 1956. Sales climbed to \$45,624,949 in the twelve months ending June 30, against \$36,154,921 for fiscal 1955. Company officers attributed the rise in sales to the firm's entrance into the polyethylene field and completion of facilities for upgrading its basic ammonia into more varied and marketable forms of nitrogen.

Praise Range Fertilization

Applications of 300 to 400 pounds of 16-20-0 fertilizer per acre on range land have produced significant increases in higher protein grass-legume forage, reports the California Fertilizer Association, which has been conducting field-size trials in various areas. In one series of trials in nine counties, 16-20-0 was found

to increase the stock-carrying capacity of the range from three to six times, at the same time making it ready for grazing six to eight weeks earlier.

According to the association, livestock turned out to graze on this fertilized range showed rapid weight increases, and the tests are reported to have indicated preference for the higher protein, higher mineral, grass.

Sohio Petroleum Completes Fertilizer Prilling Tower

Construction of the nation's largest pre-cast concrete stave prilling tower was recently completed at the new Lima, Ohio plant of the Petrochemical Division of Sohio Petroleum Co. The new tower is being used for the manufacture of urea pellets for fertilizers, and is the first of its type, using precast concrete staves reinforced with steel hoops, to be built in this country and is possibly the highest such tower in the world.

The plant, constructed by the Vulcan Engineering Division of Vulcan-Cincinnati, Inc., Cincinnati, and the Marietta Concrete Corp., Marietta, Ohio, also has a specially-constructed concrete storage bin for the

Marshall Joins B-T Research

Dr. Ernest R. Marshall recently joined the Carbide and Carbon Chemicals Co., Fellowship at the Boyce-Thompson Institute for Plant Research, Yonkers, N. Y., to coordinate field testing of new agricultural chemicals. Previous to his present appointment, Dr. Marshall conducted extensive research for five years with the G. L. F. Soil Building Service.

pellet-coating material, and separate bagging and bag storage buildings.

In operation, manufacture of the urea pellets, or prills, from the high tower resembles closely the old process used for making lead pellets or shot from the old shot towers.

In the urea prilling operation, liquid fertilizer is discharged at the top of the tower and the droplets are dried and solidified by the air as they drop to the bottom. At the completion of the tower drop, the prills are collected and coated to prevent cohesion of the individual particles. Then they are graded and stored in small holding bins, from which they are discharged into a bagging operation and then stored in bag form.

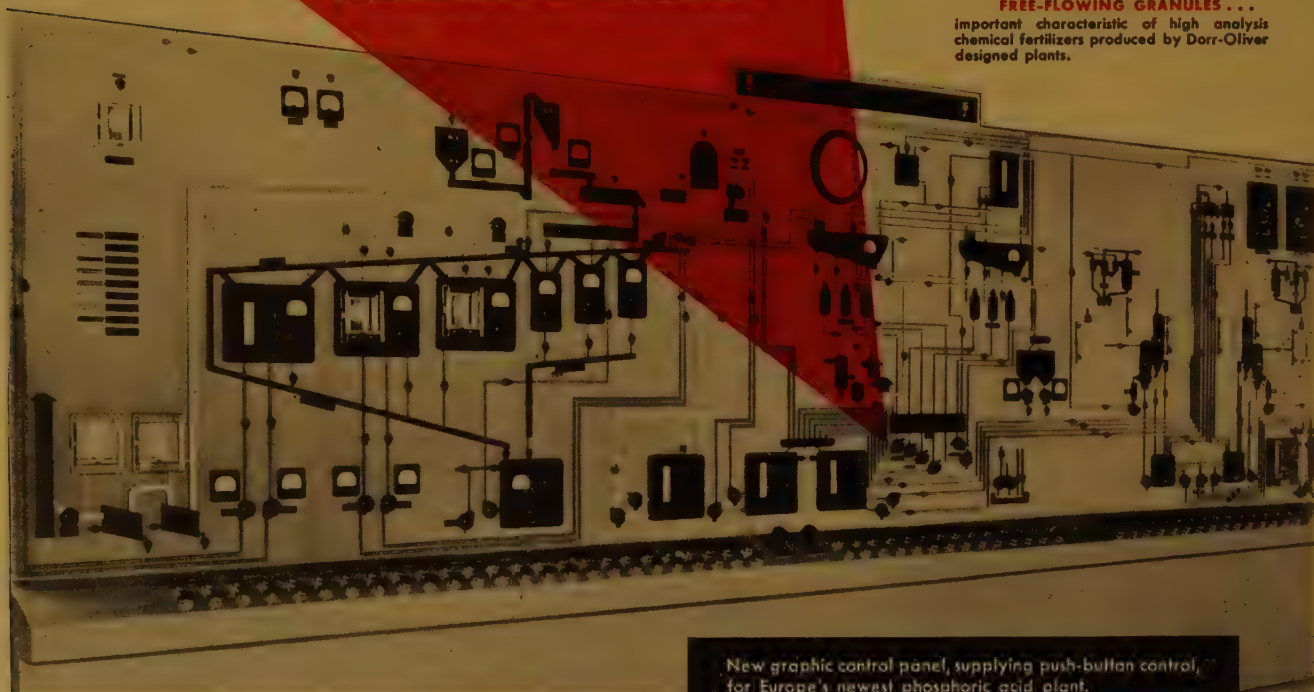
The new precast concrete stave prilling tower at the Sohio plant at Lima, O., is estimated to be the nation's largest such tower. It is being used to form urea pellets by a drop process.



Nerve Center of Europe's Newest Phosphoric Acid Plant



FREE-FLOWING GRANULES . . .
important characteristic of high analysis
chemical fertilizers produced by Dorr-Oliver
designed plants.



New graphic control panel, supplying push-button control,
for Europe's newest phosphoric acid plant.

designed – engineered – equipped by Dorr-Oliver

Europe's newest phosphoric acid producer selected Dorr-Oliver as designers and engineers for their new project. This new, fully automatic plant, one of the largest in the European fertilizer field, is being constructed with the assistance of the combined world-wide facilities of the Dorr-Oliver organization. The plant was designed by D-O's Consulting Engineering Dept., Stamford, Conn.; and by taking advantage of favorable world-wide prices, the necessary plant equipment was supplied from D-O Associate Companies in London, Milan, and Amsterdam.

Dorr-Oliver's Consulting Engineering Depart-

ment, with 40 years' experience in the field of concentrated fertilizer production via the wet process of manufacturing phosphoric acid, is staffed by engineers fully qualified to handle all phases of fertilizer plant design — from economic analysis to supervision of initial operation.

If you are considering entering the fast growing fertilizer field — or if you plan to expand present plant facilities — it will pay to check with Dorr-Oliver. Write for Bulletin #8000, or better still, let us send an engineer to discuss your problem from the standpoint of economics and process. No obligation, of course.



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DDT Program Against Mosquito

A relatively high death toll of at least five humans, 19 horses, and a great number of pheasants in Massachusetts as a result of mosquito-borne equine encephalitis has triggered an intensive emergency spray campaign in the affected and adjoining areas. Planes and spray vehicles have been crisscrossing suspected breeding areas since first reported outbreak of the disease in August, and public health officials are hoping for an early frost to dispose of survivors of the spray operation.

The U. S. Public Health Service has also reported similar infections among humans, horses, and pheasants in New Jersey; and cases in horses have been reported as far south as the Eastern Shore area of Maryland and Delaware. Massachusetts, prime danger area, attributed one fatality late last year to the disease, but early season frosts are believed to have prevented any widespread occurrence.

Dr. Roy F. Feemster, director of the Massachusetts Division of Communicable Diseases, told *Agricultural Chemicals* that the commonwealth was placing its prime dependence on DDT as the insecticide, mainly because "vigorous control measures with this chemical have not been used over a long period of time, and we are not expecting that the mosquitoes will be resistant to it." State departments have undertaken to spray by plane all of the large swamps in the breeding areas, and control of mosquitoes outside the swamps was left to the responsibility of the individual town and city governments.

Dr. Feemster's division has been recommending the spraying of roadside foliage and suspected breeding areas with one-half pound DDT per acre. For property owners, a half pound of 50% wettable DDT placed in a three gallon garden sprayer and filled three-quarters full of water is recommended as an adequate spray for a half acre of trees and bushes. For inside houses, ordinary 5% DDT insect sprays are recommended, preferably on the upper three feet of the walls where mosquitoes tend to rest between forays.



MURIATE OF POTASH for the PLANT FOOD INDUSTRY

THIS symbol stands for high-grade coarse and uniform Muriate of Potash (60% K_2O minimum). Southwest Potash Corporation provides a dependable supply of HIGH-K* Muriate for the plant food industry.

* Trade Mark

Southwest Potash Corporation

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Israel Production of Fertilizers Up to Capacity

FERTILIZERS & Chemicals Ltd., Haifa, Israel, recently announced production figures of over 2000 tons of potassium sulfate and over 8000 tons of ammonium sulfate for the first six months of this year. In its half-year report, the company also reported that the company's ammonia and ammonium sulfate plants had begun commercial production.

Fertilizers & Chemicals recently put into operation a new di-calcium phosphate plant, and reports construction of nitric acid and phosphate salt plants, plus the undertaking of technical management of the Dead Sea potash works at Sodom.

The new ammonia plant, which began production in mid-March, is currently operating above its rated capacity of 43 tons per 24 hours, with 62 employees (including supervisory staff) working three shifts. Bulk of the ammonia output is being absorbed by the ammonium sulfate plant, and limited quantities are going to local ice factories and cold storage installations.

In Israel, the most popular type of nitrogenous fertilizer is ammonium sulfate, and the company has increased daily production at its plant from a planned rate of 100 tons (30,000-35,000 tons per year) to an average rate of 170 tons, with a maximum daily rate of 205 tons. This has been accomplished mainly through technical improvements within the plant's operation.

In February, production began in the firm's di-calcium phosphate plant, and has since reached a current output of 250 tons per month—still considerably less than the rated capacity of 8000 tons per year.

Fertilizers and Chemicals currently has two plants producing a total of about 250 tons of sulfuric acid daily, with the second of these being adapted to processing sulfur. Conversion of the second plant is expected to increase total capacity to 330 tons per day.

The Kuhlman superphosphate plant, in continuous operation since 1951, has increased its production to

120,000 tons a year, nearly twice the plant's rated output. In June the company effected an improvement in the transportation system for bringing the phosphate rock from the Negev quarries to Haifa. The rock is now loaded on railway cars at the new Beersheba terminus, instead of at Migdal Gap, thus substantially shortening road transport.

In May the production of potassium sulfate reached 500 tons monthly, even though there was only one furnace in operation. Technicians have yet to overcome the difficulties resulting from corrosive action of the hydrochloric acid, a by-product of the manufacturing process.

Industry To Aid 4-H Clubs

Plans were announced last month for a program to raise funds within the fertilizer industry to aid the work of the National 4-H Club Foundation. The drive, which got under way Sept. 7, is under the direction of John V. Collis, president of the Federal Chemical Co., Louisville, and a member of the 4-H Builders' Council of the National 4-H Foundation.

The current drive is one of the several being carried on by the 4-H Builders' Council in various agricultural and industrial business areas. It will be carried out nationally.

Plan Bat Guano Operation

New Pacific Coal & Oils Ltd., a Canadian holding company, last month announced plans to mine prehistoric bat guano from caves in the walls of Arizona's Grand Canyon. According to company officials, the site is North America's only known supply of high nitrogen guano, used in both fertilizer and pharmaceutical production.

The company has announced that production, which is expected to begin before the end of the year, will be somewhere in the vicinity of 9000 tons a year, most of it slated to be bagged for sale on the west coast. New Pacific officials predict a net of more than \$100 per ton from the guano.

Growth Control Studied

4000 scientists and technicians attending the recent annual conference of the American Institute of Biological Sciences at the University of Connecticut, Storrs, Conn. heard two Cornell researchers report on a new system for observation of chemical control of plant cell growth and division. The researchers, Dr. Frederick C. Steward and Dr. Edgar M. Shantz of the Cornell University College of Agriculture, reported on their efforts to isolate a mysterious growth-stimulating substance existing in coconut milk. From 700 gallons of the milk, separated by chemical means into fractions, they succeeded in isolating a few crystals which were found to be capable of stimulating abnormal plant growth in tissue culture tests. These growth stimulants are reported to have been active in concentrations as low as one ppm.

Merck Official Dies

James J. Kerrigan, until recently president of Merck & Co., Inc., Rahway, N. J., died early last month. At the time of his death he was chairman of the executive committee of the firm's board of directors.

European Crops Menaced

Unusually heavy rains all over Europe are causing extremely heavy crop damage, reported *The New York Times* last month. The damage so far reported has been mainly to the wheat crop in France, West Germany, and Switzerland, (with indications of further damage in the USSR) and to the potato crop in England and Belgium. Wheat standing in shocks in the wet fields is beginning to sprout and mildew, and the potatoes are rotting underground.

The Times reports that in normally sunny August, a principal harvest month for both these crops, it rained on more than half the days. If the damage to the wheat crop is as heavy as early estimates, this will be the second crippling blow the wheat farmers have suffered in less than a year. Last winter's severe and prolonged cold spell practically ruined the winter wheat crop in Western Europe.

Koehring Appoints Three

The Koehring Co., Milwaukee, construction equipment manufacturer, announced last month the appointment of three new district representatives. H. R. Powers, formerly general manager of the Koehring Co. of California, has been named district representative for the company and its subsidiaries in Washington, Oregon, Idaho, and Montana. C. M. Anderson was appointed Southwest district representative, covering Texas, New Mexico, Louisiana, Oklahoma, and Mexico; and L. J. Meyers was named representative for Illinois, Indiana, Kentucky, Tennessee, Missouri, and Mississippi. All three men will handle the products of the Parsons, Co., Newton, Iowa, and Kwik-Mix Co., Port Washington, Wis., Koehring subsidiaries, as well as those of the parent company.

St. Regis Official Dies

William H. Versfelt, vice-president, treasurer, and a director of the St. Regis Paper Co., New York, died last month. He also held the three posts in the St. Regis Paper Co. of Canada Ltd., the St. Regis Timber Co. Ltd., Northwestern Pulp and Power Ltd., and the Norwood and St. Lawrence Railroad.

Mr. Versfelt joined the company in 1921, was named assistant treasurer in 1928 and treasurer in 1935. He was a leading figure in the development of the company, and was elected vice-president in 1945.

Plan New Research Lab

An orange grove in Anaheim, Calif. has been selected as the site of a completely modern research laboratory for the United States Borax & Chemical Corp., New York. The laboratory will conduct research for all three of the company's operating divisions: Pacific Coast Borax Co., U. S. Potash Co. and 20 Mule Team Products.

The site was reportedly specially selected to produce the best possible "climate" for scientific research. Building plans call for division into four separate segments, with storage and utilities areas to be located in the center and laboratory wings on either

side. An administration wing will connect the major elements.

The laboratory will be fully equipped for all phases of chemical research. In addition to numerous standard laboratories, a distillation room, an instrument laboratory, a library, a heavy experimental equipment room, and an agricultural greenhouse are included in the special facilities. Construction began in September, with completion scheduled for April of next year. It will cost an estimated \$850,000.

Appointed Research Mgr.



Dr. William S. Emerson recently joined American Potash & Chemical Corporation, Los Angeles, as manager of research at the company's Whittier (Calif.) Research Laboratory. From 1941 until he joined American Potash, he had been with Monsanto Chemical Co., St. Louis, becoming assistant development director for that company.

Hercules Lists 2 Changes

The Hercules Powder Co., Wilmington, Del., recently announced two staff appointments, one in the East and the other in the Midwest. Walter E. Whiteis, operating department supervisor of the company's Synthetics Department plant at Burlington, N. J. was appointed technical superintendent of the Hercules ammonia works at Louisiana, Mo., and James H. Gunning, chemist at the Burlington plant, was appointed to succeed Mr. Whiteis at the N. J. plant.

Complete Toxicology Lab

A new \$150,000 industrial toxicology laboratory was recently completed by the Industrial Bio-Test Laboratories, Inc., at Northbrook, Ill., with a greenhouse for the study of agricultural chemicals and residues to be added to the facilities in the fall. The air-conditioned laboratories cover 8000 square feet, and are designed to provide comprehensive biological evaluations of new materials and chemicals. The facilities include bacteriology laboratories.

Cyanamid Appoints Coulter

The appointment of J. Ray Coulter as manager of manufacturing for the Agricultural Chemicals Division was announced last month by American Cyanamid Co., New York. At the same time the company reported the appointment of Thomas P. Turchan, whom Mr. Coulter succeeds, as assistant general manager for the firm's Industrial Chemicals Division.

Mr. Coulter formerly spent 12 years with Anaconda Copper's European interests. He joined Cyanamid in February, 1955. In his new position he will be responsible for manufacturing activities at the division's plants in Brewster, Fla., and Niagara Falls and Stamford Township, Ontario.

To Feature Sales Theme

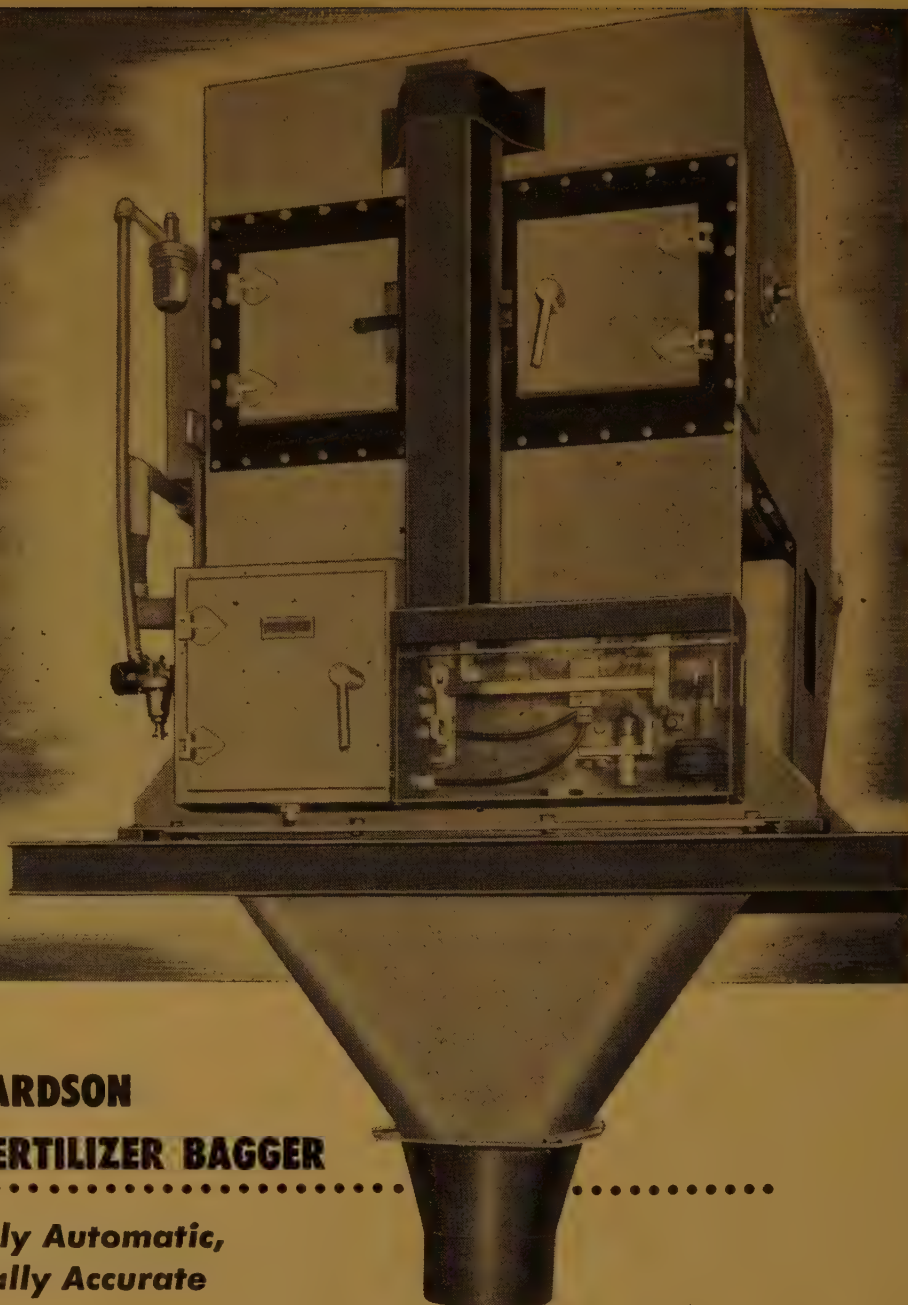
"How Leading Dealers Sell More Garden Supplies" by Dr. Max E. Brunk and Dr. Lawrence B. Darrach of Cornell University will be among the feature presentations at the National Garden Supply Shows this winter. The shows will be held at Chicago's Navy Pier Nov. 18-20 and at New York's Kingsbridge Armory Jan. 13-15. More than 20,000 dealers, distributors, and manufacturers are expected to attend the shows.

Grant Chilean Nitrate Loan

Two Chilean nitrate companies were granted credits totaling \$27.8 million last month to finance American equipment and services to modernize and expand their operations, the Export-Import Bank announced last month. The Anglo-Lautaro Nitrate Corp. was authorized a loan of \$16 million, and Cia. Salitrera de Tarapaca y Antofagasta (CSTA) was granted one for 11.8 million.

Anglo-Lautaro produces about two-thirds of Chilean nitrate, and the Tarapaca company is the country's second largest producer. According to a report in the *New York Journal of Commerce*, the approved funds will be used to purchase U. S. equipment to crush, process, and refine nitrate ores; power plants; construction and transport equipment, and engineering and technical services.

**Weighs,
Bags Fertilizer
20 to 24 Sacks
A Minute!**



New RICHARDSON MODEL HA-39 FERTILIZER BAGGER

**Is Completely Automatic,
Exceptionally Accurate**

Where it counts this new Richardson Model HA-39 Fertilizer Scale leads the field—on all counts!

LEADS IN SPEED, ACCURACY AND ECONOMY . . . Actually up to twenty-four 50-lb., 80-lb., 100-lb., or 125-lb. bags of fertilizer per minute can be realized with extremely close accuracy per bag! It's built to save you time, labor, materials—year after year!

LEADS IN SIMPLICITY OF OPERATION . . . Completely automatic . . . incorporates belt feeder within the scale, pneumatic power for smooth, positive operation, and simplified electrical controls. Scale works steadily, continuously, to keep your production at a uniform record level (yet can be shut off, when necessary, with weigh hopper loaded).

Regulating gate controlling depth of stream on belt is conveniently adjustable from floor level.

LEADS IN EASE OF MAINTENANCE . . . Hopper is heavy-gauge stainless plate, and all other contact parts are of stainless steel. Controls are totally-enclosed—

dust-tight. Entire unit is simple to understand, operate and maintain . . . built and backed by Richardson, the name representing over 50 years of experience with problems in every phase of weighing and proportioning.

Get all the facts. They're contained in Richardson Product Data Sheet No. 5601. Write for your free copy.

Richardson

MATERIALS HANDLING BY WEIGHT SINCE 1902

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Richardson Scales S.A., 1-3 Rue de Chantepoulet, Geneva, Switzerland
Richardson Scale Co., Ltd., 40-42 George Street, Nottingham, England

NEWS *Brevities*

COMMERCIAL SOLVENTS CORP., New York, has named A. W. Kinard III, formerly with the Nitrogen Division of Allied Chemical and Dye Corp., to its agricultural chemicals marketing and distribution organization in the Southeast. He will cover the state of Florida.

AC

SINCLAIR CHEMICALS, INC., New York, announced recently the appointment of Dr. Leo E. Orth as agronomist in their Nitrogen Products Division headquarters in Chicago. The division will handle marketing of anhydrous ammonia and nitrogen solutions from the new manufacturing plant at Hammond, Ind.

AC

DR. J. D. CLARY, formerly assistant works manager at Curtis Bay, Baltimore, was recently named production superintendent at the Florida Phosphate Division of the Davison Chemical Co., Division of W. R. Grace & Co. Dr. Clary has been with the company since 1951.

AC

VIRGINIA-CAROLINA CHEMICAL CORP., Richmond, announced a drop in sales of over \$7 million for the year ending June 30. Net sales for fiscal 1956 were listed as \$70,195,211, as compared with last year's figure of \$77,454,972.

AC

CLARK EQUIPMENT CO., Battle Creek, Mich. has moved its service school, formerly located in Jackson, Mich., to new quarters at Battle Creek.

AC

DR. WILLIAM R. MEAGHER, formerly with the Division of Laboratories of the California State Dept. of Public Health at Berkeley, was recently appointed to the research de-

partment of the Chemagro Corp., Pittsburgh.

AC

STAUFFER CHEMICAL CO., New York, announced recently the ap-

pointment of Gregory Schultz as an industrial engineer at its Niagara Falls plant. Prior to joining Stauffer, Mr. Schultz was a methods and planning engineer for E. I. Du Pont de Nemours Co., Inc.

AC

AMERICAN CYANAMID CO., New York, recently appointed Thomas P. Turchan assistant general manager of its Industrial Chemicals Division. He had been manager of manufacturing of the company's Agricultural Chemicals Division, and before joining Cyanamid was works manager for Stauffer Chemical Co. at Niagara Falls, N. Y.



**All styles of steel pails
and drums — Sizes 1-1½-2-2½-3
3½-4-5-6-6½-10-12 gallons**



**Available with all types
Nozzles and Pouring Spouts**

Vulcan makes the finest open head steel pails and closed head drums in the above sizes... Every pail thoroughly tested... All meet rigid I.C.C. specifications.

Hi-Bake Linings Assure Protection

Vulcan chemists will work with you to develop a Hi-Bake protective interior lining to meet your specifications and packaging problems... Your assurance of "positive product protection." Complete facilities available to design and lithograph your Brand Name on any size or style container.

If we don't have what you want—we'll design it!

Call or write today for samples and more information.

OVER 40 YEARS CONTAINER EXPERIENCE

VULCAN CONTAINERS INC.

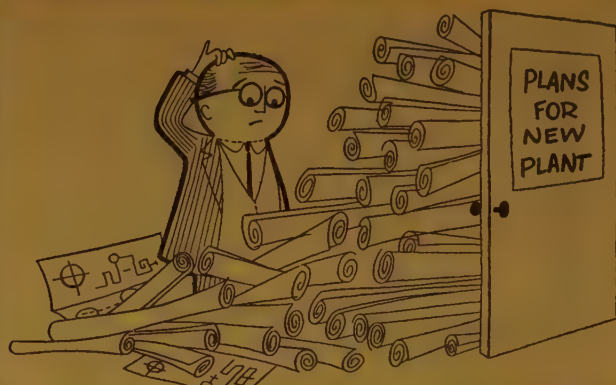
Bellwood, Illinois (Chicago Suburb) Phone: Linden 4-5000

In Toronto, Canada—Vulcan Containers Limited.

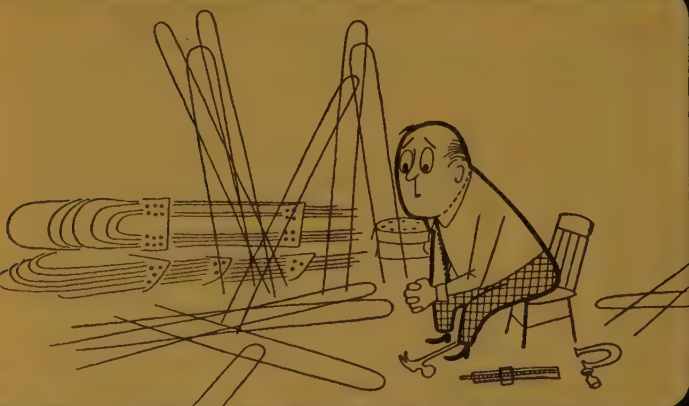
Representatives in all Principal Cities



PLANNING A NEW UNIT - OR A COMPLETE PLANT, MILL OR REFINERY?



PROBLEMS OF DESIGN AND CONSTRUCTION ARE PILING UP



SURE YOU HAVE GOOD ENGINEERS - BUT NOW THEY MUST COPE WITH UNFAMILIAR PROBLEMS



AND YOUR STAFF JUST ISN'T BIG ENOUGH



WHY NOT CALL IN LUMMUS, WITH ITS ARMY OF EXPERT ENGINEERS?



YOU'LL GET JUST THE JOB YOU WANT AT MINIMUM CAPITAL INVESTMENT

The cartoon, of course, states the situation in very simple terms. But the basic truth is there. Building a new chemical installation, paper mill, petroleum refinery or power plant is more than a "do-it-yourself" project. Lummus has built over 700 plants throughout the world. When you are ready to build your next plant, you can call in thousands of trained men — without adding to your payroll — by calling in Lummus. And remember, your process "secret" is safe with half-century-old Lummus.



ENGINEERS AND CONSTRUCTORS FOR INDUSTRY

NEW YORK • CHICAGO • HOUSTON • THE HAGUE • LONDON • MONTREAL • PARIS

THE LUMMUS COMPANY

385 Madison Avenue, New York 17, N. Y.

DR. CHARLES C. D'OANE, formerly with the Shell Chemical Corp., has joined the staff of the Department of Entomology at the Connecticut Agricultural Experiment Station, New Haven. He will study biology and control of the elm bark beetle.

AC

J. R. STIEFLER was recently appointed advertising manager of the Smith-Douglass Co., Inc., Norfolk, Va. He will coordinate advertising and sales promotion for S-D fertilizer plants, the Coronet Phosphate Co., Smith-Rowland Co., and the San Jacinto Chemical Co.

AC

U. S. INDUSTRIAL CHEMICALS Co., New York, a division of National Distillers Products Corp., has appointed Tom E. Martin to the post of field service engineer for its Chemical Sales Dept. He had been director of the engineering service division of Snyder Chemical Co., Topeka, Kan.

AC

SINCLAIR CHEMICALS, INC., New York, announced recently the appointment of Elwyn C. Weiss as sales representative, Nitrogen Products Division, for the territory of Indiana, Michigan and Ohio. He will make his headquarters at Winona Lake, Ind.

AC

THE NEW YORK CITY PARK DEPARTMENT last month embarked on a spraying program to eliminate the tussock moth caterpillar from the city's trees. The department reports unusually heavy caterpillar infestation of trees both in parks and on streets and private property.

AC

PARKS-BARNES, INC., Hermosa, Cal., plant food manufacturer, recently purchased a nine-acre site near Paris, Ky. It will be used for a branch plant and will provide 6000 square feet of space.

AC

DR. GEORGE H. PLUMB has been appointed entomologist of the Bartlett Tree Research Laboratories, Stamford, Conn. He had been chief entomologist with the U. S. technical mission to Afghanistan, under the

State Department's International Cooperation Administration.

AC

NORTHWEST COOPERATIVE MILLS, St. Paul, recently named W. E. Jones, formerly production engineer, to the post of manager of the Fertilizer Division.

AC

JOHN P. PORTER was recently appointed sales supervisor for the Southern Nitrogen Co., Georgia.

J. N. DAVIS, of Leesville, S. C., was elected president of the South Carolina Plant Food Educational Society at the group's recent annual meeting at Clemson. He succeeds Henry E. Clifford.

AC

GEORGE E. MILLER recently joined Carbide and Carbon Chemicals Co., New York, a division of Union Carbide and Carbon Corp., as a technical representative for Crag agricultural chemicals.

Ruggles - Coles

DRYERS, KILNS, COOLERS

Ruggles-Coles Rotary Dryers, built by Hardinge, are available in the following styles:

CLASS XA

—Double shell, semi-direct heat. High efficiency. For materials that can be dried in direct contact with combustion gases and heated above 212°.

CLASS XB

—For materials that must be dried by indirect heat but can be heated above 212°. A double shell dryer with low dust loss.

CLASS XC

—Steam tube dryer for materials that must be dried by indirect heat and at low temperatures, such as chemicals, grains, food products.

CLASS XF

—For direct heat drying at temperatures above 212°. A single shell, counter-flow dryer that does not discharge the material through the furnace.

CLASS XH

—For direct heat drying at temperatures above 212°. A single shell, parallel flow dryer designed to handle sticky materials.

CLASS XW

—For material that can be dried by hot air at temperatures below 212°. Dries ammonium nitrate; potassium chloride, etc.

KILNS

—Rotary type for drying, calcining, roasting or oxidizing at temperatures above the range of ordinary dryers. Refractory lined.

COOLERS

—Air, water spray or submerged rotary type. Each designed for the efficient cooling of materials from kilns or roasters.

Bulletin 16-D-57 describes entire Ruggles-Coles line.

HARDINGE

COMPANY, INCORPORATED

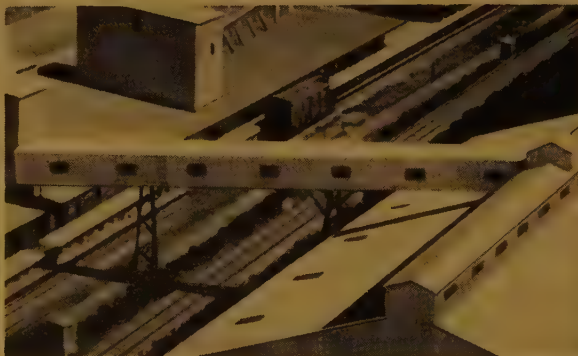
YORK, PENNSYLVANIA • 240 Arch St. • Main Office and Works
New York • Toronto • Chicago • Hibbing • Houston • Salt Lake City • San Francisco

Can standardized structures meet the custom requirements of a complex fertilizer plant? The answer proved to be "Yes, emphatically!"

WHY DIXIE GUANO COMPANY CHOOSES LURIA BUILDINGS



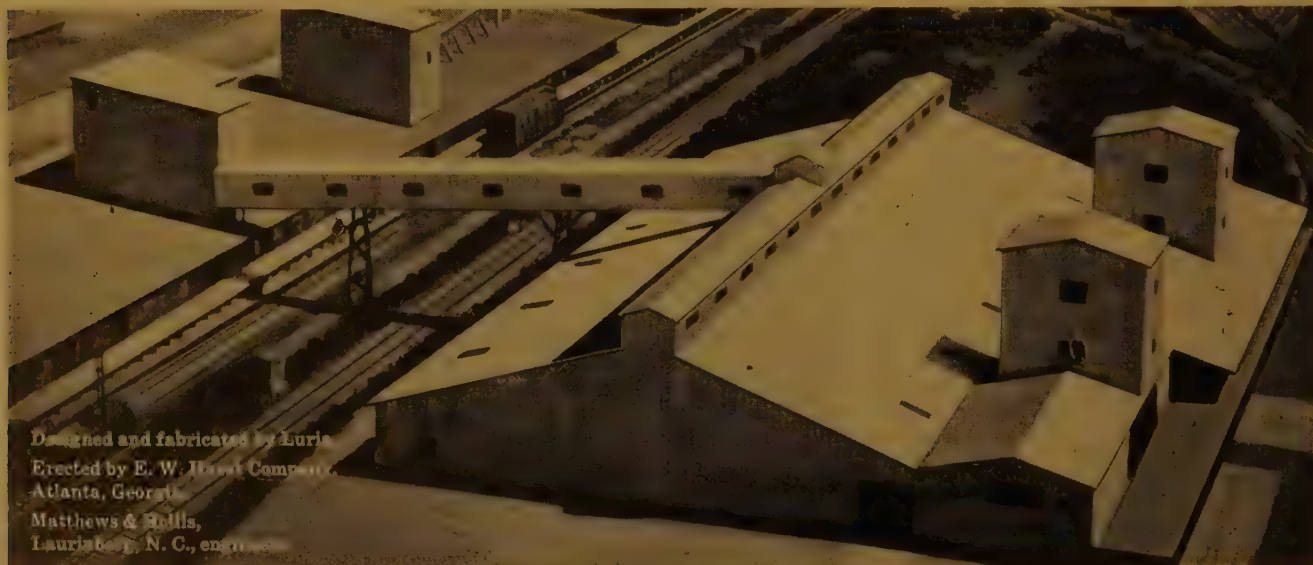
Bulk Storage Area with capacity of 12,000 tons of fertilizer can be filled during seasonal lulls by a single man.



Standardized Overhead Bridge by Luria contains conveyor belts that efficiently transport materials from the processing plant to the shipping center.



Multi-Story Buildups, adaptable to *individual* needs, house special processing machines.



Designed and fabricated by Luria
Erected by E. W. Hest Company
Atlanta, Georgia
Matthews & Ellis,
Lauriaton, N. C., engineers

Luria unites high speed, low cost construction with the special design requirements of custom building.

"Customized" to your *individual* needs,
"standardized" to bring speed and

economy to your expansion program—these are just two of the many advantages provided by Luria structures.

The list of Luria customers in the commercial fertilizer field is as impressive as the list of Luria advantages. Contact your Luria representative—*you'll find that it pays!*



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511 Fifth Avenue, New York 17, New York • Plant: BETHLEHEM, PENNSYLVANIA
District Offices: ATLANTA, PHILADELPHIA, BOSTON, CHICAGO, WASHINGTON, D. C.

MEETING CALENDAR

- Oct. 9 — Western Agricultural Chemicals Association, Villa Hotel, San Mateo, Cal.
- Oct. 8-10 — The Carolinas-Virginia Pesticide Formulators Association, Holly Inn, Pinehurst, N. C.
- Oct. 14-15—International Sanitation Maintenance Show and Conf. City Coliseum, New York City
- Oct. 15 — Chemical Sales Clinic, sponsored by the Salesmen's Association of the American Chemical Industry, Commodore Hotel, New York, N. Y.
- Oct. 15-20—Control Officials Meeting (as detailed below) Shoreham Hotel, Washington, D. C.
- Oct. 15-17—Association of Official Agricultural Chemists
- Oct. 17-18—Association of American Feed Control Officials
- Oct. 18-19—Association of American Fertilizer Control Officials
- Oct. 19-20—Association of American Pesticide Control Officials
- Oct. 16-17—National Nitrogen Solutions Assn., City Auditorium, Sioux City, Ia.
- Oct. 16-18 — Fertilizer Industry Round Table, Shoreham Hotel, Park Room, Washington, D. C.
- Oct. 16-18—Canadian Agricultural Chemicals Assoc., Sheraton Brock Hotel, Niagara Falls, Ontario, Canada.
- Oct. 22-23 — Fertilizer Section, National Safety Council, La Salle Hotel, Chicago.
- Oct. 23-24 — Pacific Northwest Garden Supply Trade Show, Sh.ine Auditorium, Portland, Ore.
- Oct. 24-26 — Pacific Northwest Section of American Society of Agricultural Engineers, Pennicton, British Columbia.
- Oct. 22-25—National Pest Control Association, Sheraton - Cadillac Hotel, Detroit, Mich.
- Oct. 25 — Middle West Soil Improvement Committee, Sherman Hotel, Chicago, Ill.
- Oct. 30-31—8th Annual Aerial Dusting and Spraying Conference, sponsored by the Institute of Agricultural Sciences of the State College of Washington, Marcus Whitman Hotel, Walla Walla, Washington.
- Nov. 2 — First Annual Southern Soil Fertility Conference, Atlanta Biltmore Hotel, Atlanta, Georgia.
- Nov. 2—Fertilizer Industry Work Conference, Atlanta-Biltmore Hotel, Atlanta
- Nov. 7-9 — Agricultural Ammonia Institute, Atlanta Biltmore Hotel, Atlanta, Ga.
- Nov. 7-9 — Pacific Northwest Plant Food Association, Harrison Hot Springs Hotel, British Columbia.
- Nov. 11-13—California Fertilizer Association, Coronado Hotel, Coronado, Calif.
- Nov. 13-15 — New York State Insecticide and Fungicide Conference, 18th Annual Meeting, and Pesticide Application Equipment Conference, 9th annual meeting. Bibbins Hall, Cornell U., Ithaca, N. Y.
- Nov. 18-20—Midwest Garden Show, Navy Pier, Chicago.
- Nov. 19-20 — Ohio Pesticide Institute, Neal House, Columbus, Ohio.
- Nov. 19-20 — Entomological Society of America, Eastern Branch, Hotel Haddon Hall, Atlantic City, N. J.
- Nov. 27-28—Indiana Fertilizer Conference, Memorial Union Building, Purdue Univ., Lafayette, Ind.
- Dec. 6-8 — American Phytopathological Society, Netherland Hilton Hotel, Cincinnati, Ohio.
- Dec. 9-12 — National Meeting of American Society of Agricultural Engineers, Edgewater Beach Hotel, Chicago, Ill.
- Dec. 10-12 — North Central Weed Control Conference, Sherman Hotel, Chicago.
- Dec. 27-31 — Entomological Society of America, national meeting, Hotel New Yorker, New York City.
- Jan. 10-12 — Northeastern Weed Control Conference, Sheraton-McAlpin Hotel, New York.
- Jan. 13-15 — Garden Supply Show, Kingsbridge Armory, New York.
- Jan. 23-25 — Southern Weed Conference, Bon Aire Hotel, Augusta, Ga.



FOR DUST FORMULATORS ONLY

The leaf shown above is infested with aphids. These tiny sap-sucking insects seldom move more than a few inches a day. This sluggishness and their manner of feeding require the deposition of a contact insecticide on these hard-to-kill insects. Coverage of the entire plant surface is necessary for adequate control.

The characteristics of any dust reflect the quality of the diluent used. Most

dusts have less than 20% toxicant; the remainder is an inert diluent with which the toxicant must be in intimate contact for maximum effectiveness.

PYRAX ABB, the most compatible diluent with workable bulk density, imparts flow and anti-caking properties to dust mixes. **PYRAX ABB** promotes electrostatic dispersion of the dust cloud, assuring coverage of the entire plant surface.



R.T. VANDERBILT CO.

SPECIALTIES DEPARTMENT

230 PARK AVENUE, NEW YORK 17, N. Y.

USE

THIS

HANDY

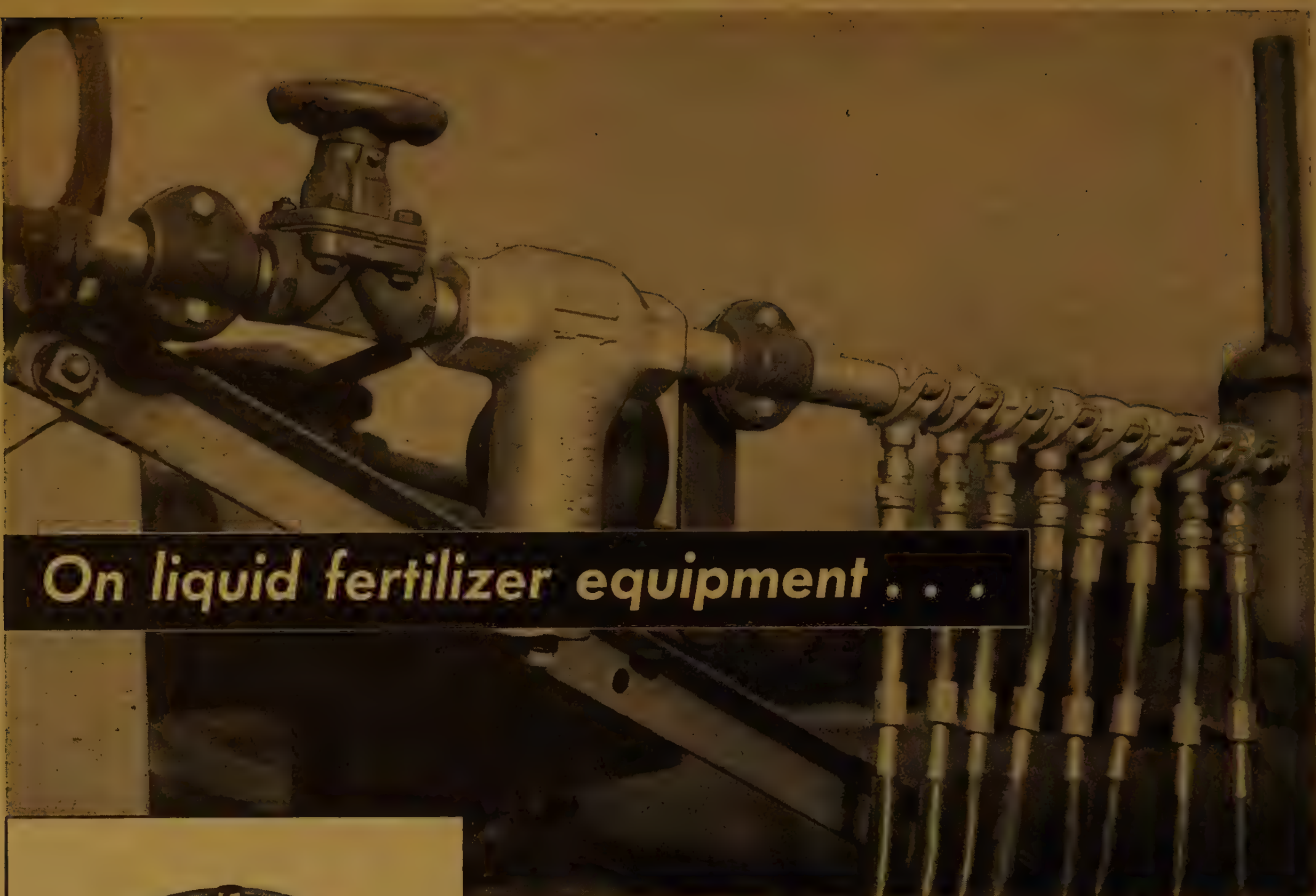
COUPON

Please send ☐ Bulletin 23D ☐ Sample **PYRAX ABB**

NAME _____

POSITION _____

(please write on or attach to company letterhead)



On liquid fertilizer equipment . . .

Photo courtesy Tryco Mfg. Co., Inc.



Handwheel valve,
rising stem, screwed ends, $\frac{1}{4}$ " to 3".



One-quarter turn,
quick-acting valve, $\frac{1}{2}$ " to 2".

Specify GRINNELL-SAUNDERS DIAPHRAGM VALVES

For trouble-free operation, long life — be sure the nitrogen solutions piping you buy is equipped with Grinnell-Saunders Diaphragm Valves — the proved-in-performance valve for handling corrosive chemicals. Valve design absolutely isolates the operating mechanism from the fluid in the line. Resilient diaphragm assures leakproof closure, even if grit or scale are in the line. Maintenance is simple. Diaphragm may be replaced without removing valve from the line. No refacing or reseating is necessary.

Bodies of cast iron (plain or rubber-lined), aluminum, stainless steel; diaphragms of rubber, neoprene, or other synthetics. Grinnell Company, Inc., Providence, R. I. Branches in principal cities.



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GRINNELL-SAUNDERS DIAPHRAGM VALVES

AGRICULTURAL CHEMICALS

Equipment AND BULLETINS

Bell Issues Brochure

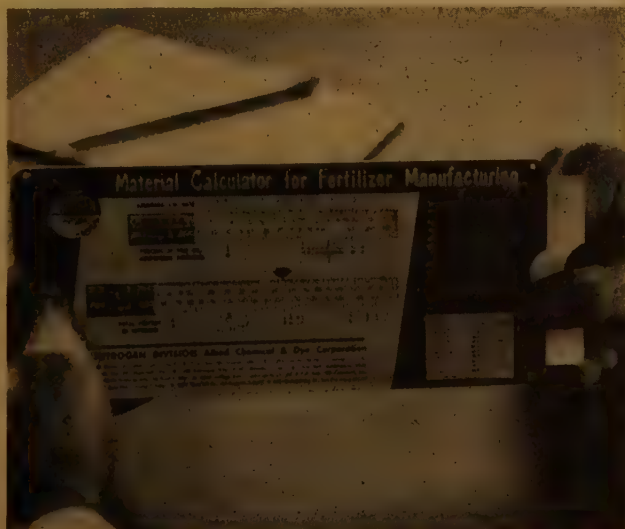
A forty-page, plastic-bound brochure on all operations of the Bell Clay Co., Gleason, Tenn., is being



distributed to the company's clients and prospects. Its first four sections give facts and data on Bell Clay Co., Bell Kaolin Co., Bell Minerals Co., and Bell Research, Inc., with an additional section giving general information about all four.

New Measuring Device

A device to determine the amount of raw materials required for any fertilizer mixture is being distributed by the Nitrogen Division, Allied Chemical & Dye Corp., 40 Rec-ter St., New York. It consists of special slide rules built into a stiff cardboard frame, and is rugged, compact, and it's small enough to fit in the back pocket. By manipulating the slides a mixer can compute the amounts of various types of nitrogen solution, superphosphate, and potash materials needed to manufacture any fertilizer grade.



To Market Tree Preservative

H. D. Campbell Co., Rochelle, Ill., liquid fertilizer manufacturers, have begun marketing a special Christmas tree preservative formulated to prevent falling needles and maintain color. Labeled "Gro-Green," the formula contains nutrients which are taken into the fibers of the tree in a water solution. According to the company, a single bottle contains sufficient preservative to feed an average eight-foot tree for the entire holiday season.

New Renneburg Catalogue

Edw. Renneburg & Sons Co., Baltimore, last month issued a new catalogue on their granular fertilizer processing equipment. The catalogue, titled "Renneburg Continuous Granular Fertilizer Processing Equipment," contains a number of illustrations and photographs on each page.

Among the equipment featured is the new Renneburg Continuous Combination Ammoniator-Granulator, Dryer Furnaces, Dryers, Coolers, and



SPECIALISTS in MAGNESIA for AGRICULTURE

EMJEO (80/82% Magnesium Sulphate) Calcined Brucite (fertilizer grade) 65% MgO

POTNIT

(95% Nitrate of Potash) for

Special Mixtures and Soluble Fertilizers
Other Fertilizer Materials

Insecticides - Fungicides

Mercury Compounds for Agricultural Use

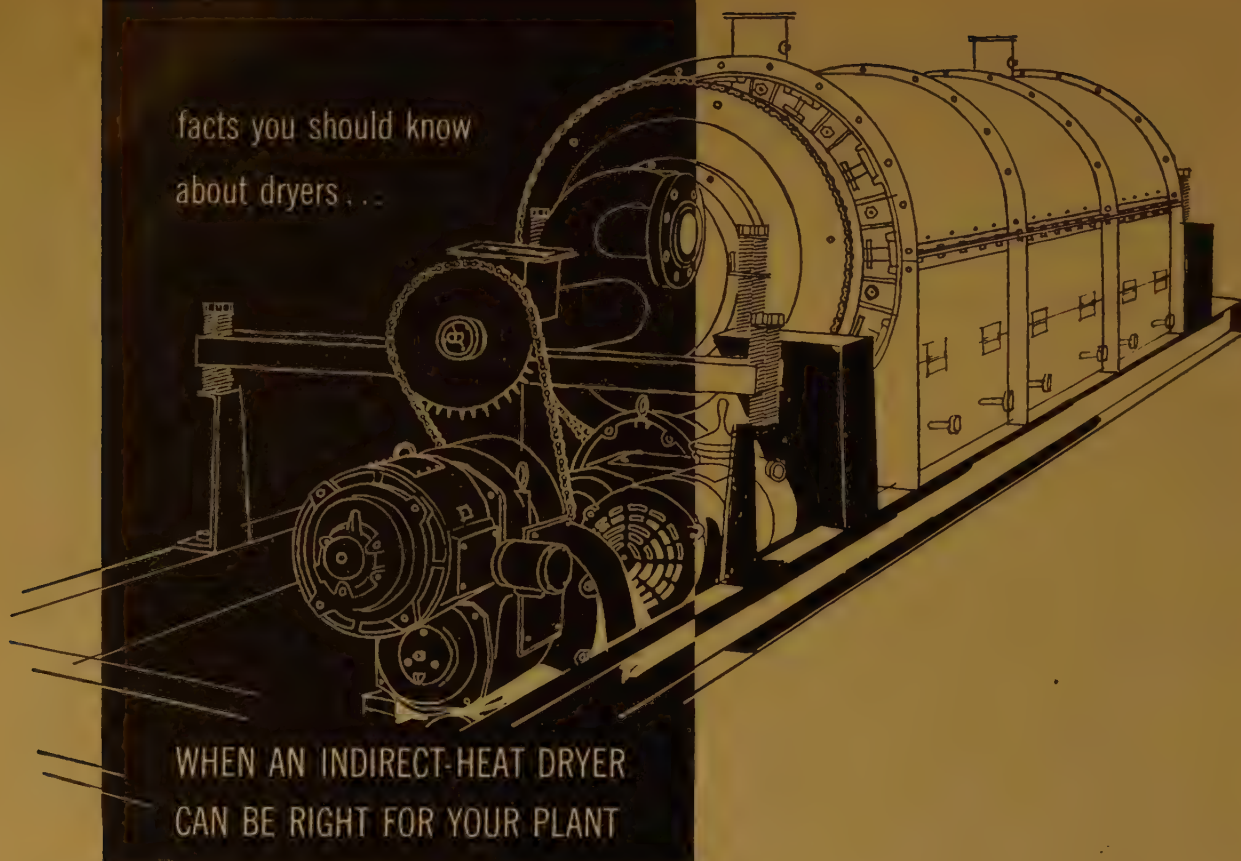
DITHIOCARBAMATES

FERRIC — ZINC

EXPORT-IMPORT

BERKSHIRE CHEMICALS, INC.
420 LEXINGTON AVE. • NEW YORK 17
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Innis Speiden Company Division
New York • Philadelphia • Boston • Cleveland
Chicago

facts you should know
about dryers . . .



WHEN AN INDIRECT-HEAT DRYER
CAN BE RIGHT FOR YOUR PLANT

For over 55 years, Louisville Dryers have been solving industry's drying problems and effecting marked economies. The records of this experience can often be applied to specific cases, possibly yours. For example . . .

Q. *My material is a filter cake, practically all minus 325 mesh, and must not contact furnace gases. It can be heated to 500° F. at least, without injury. What type of dryer would do the job best?*

A. You might consider using a direct-heat rotary dryer that utilizes clean, heated air as the drying medium—air heated by steam coils or a gas or oil fired heat exchanger. However, this introduces a considerable dust collection problem. Besides, from a standpoint of capacity, it is inefficient as well as from a heat-cost standpoint. This makes it unduly expensive. Therefore, a type of indirect-heat rotary dryer is indicated which would greatly reduce both the

dust problem and the heat cost.

Q. *What is meant by an indirect-heat rotary dryer?*

A. One in which the material to be dried is warmed by contact with the heated metal surfaces, which in turn are heated by the medium used (usually furnace gases or steam). Those using furnace gases are called "indirect fire dryers". Atmospheric and vacuum drum dryers are examples of steam-heated indirect dryers, but the type in greatest use is the steam tube dryer. This is often referred to as the "Louisville Type" because of the thousands of Louisville Steam Tube Dryers built during the past 55 years.

Q. *How does an indirect-heat dryer minimize the dust problem?*

A. In an indirect-heat dryer, only enough air is admitted to carry off the evaporated moisture. Thus, the air has nothing to do with the heating

of the material. Generally, this low air velocity results in insignificant dust loss.

Q. *How does this differ from the operation of a direct-heat dryer?*

A. In direct-heat dryers, the hot air furnishes the heat for drying besides removing the evaporated moisture. The amount needed to supply the necessary heat results in a sufficiently high velocity through the dryer to carry out an excessive amount of fine material particles.

Q. *It seems I need an indirect-heat dryer. How can I get competent advice and more information regarding my particular requirements?*

A. The Louisville Dryer engineering staff will be glad to analyze your requirements, arrange for necessary pilot plant tests, and submit an unbiased recommendation accompanied by estimated costs. You incur no obligation by using this service.



LOUISVILLE DRYING MACHINERY UNIT

GENERAL AMERICAN TRANSPORTATION CORPORATION

Dryer General Sales Office: 139 So. Fourth Street, Louisville 2, Kentucky

Eastern Sales Office: 380 Madison Avenue, New York 17, New York

In Canada: Canadian Locomotive Company, Ltd., Kingston, Ontario, Canada

General Offices: 135 S. La Salle Street, Chicago 90, Illinois

air handling systems. The 12-page booklet also includes a number of flow charts and diagrams to explain function of the equipment.

The catalogue describes in detail the advantages of the ammoniator-granulator, pointing out that it allows higher rates of ammoniation by simply increasing the variable speed drive or by changing the V-belt sheave. Bed depth can be similarly controlled.

Offer Merchandising Aids

Six new merchandising aids were recently offered for pest control operators by the Velsicol Chemical Corp., Chicago. Three of the aids are self-mailing folders, dealing with control of termites, lawn insects, and household insects.

Also available are a series of three small size newspaper ad mats and a picture sheet featuring common insects, either of which can be used in the preparation of promotion pieces and newspaper ads. Samples of the aids may be obtained from Velsicol Chemical Corp., 330 E. Grand Ave., Chicago 11.

Add New Granulating Units

The Blue Valley Equipment Manufacturing and Engineering Co., Topeka, Kan., announced recently the addition of two new sizes of granulating units to their line of fertilizer plant equipment. The additions bring to a total of four the units now built by Blue Valley, ranging in size from 12, 18, 24 to the 36 average ton-per-hour. All four units are built for either double or single screening, for either batchmixing or continuous ammoniation.

New Fertilizer Mixing Unit

A new package liquid fertilizer mixing unit with a mixing capacity of 120 tons of liquid fertilizer per an eight hour period was introduced recently by the Standard Steel Mfg. Co., Inc., Indianapolis. The unit is self-contained, meters and weighs automatically the raw materials for batch mixing.

The mixing unit is skid mounted and 18 feet long, 8 feet wide, and 14 feet high when assembled completely.



It will handle dry-foam potash, aqua ammonia, liquid urea-ammonium-nitrate, phosphoric acid, and other liquid fertilizer additives. It is reportedly the only unit that can use anhydrous ammonia for direct batch mix without special converting mechanisms.

The unit is equipped with

Neptune meters, Duriron pumps, Sterling motors, stainless steel mixing tank and fittings, Alsop agitator, Buffalo scale, and Allen Bradley electric controls. Units of this type were in operation throughout the East and Midwest last season, and the company reports highly successful results with the present model.

CHEMICALS FOR AGRICULTURE

COPPER SULPHATE

Crystals Powdered
Basic Copper Sulphate

ZEE-N-O

Neutral Zinc 56% Zinc as metallic
The Highest Test Nutritional Zinc

MANGANO

Neutral Manganese 55% Manganese as metallic

W. R. E. ANDREWS SALES, INC.

1505 Race Street, Philadelphia 2, Pa.

Since 1926

Agricultural Chemical Specialists

**TO MANUFACTURERS AND
DISTRIBUTORS OF FERTILIZERS**

This advertisement, appearing in farm publications in Florida, Delaware, Maryland, New Jersey and Washington State, tells farmers, planters and fruit growers what Moly in fertilizer can do in combating soil deficiencies and improving yields. Several firms are already adding Moly to their blends. Write Dept. 43, Climax Molybdenum Company, for more facts about the extra value to your customers and extra profit to you which can result from the addition of MOLY to your fertilizer blends.



Clyde Speck and Willard King load fertilizer in the spreader, for use on Mr. Speck's farm, near Asbury, New Jersey.

MOLYBDENUM increases alfalfa yield on New Jersey soil

Adding Molybdenum to Moly-deficient soil gives the farmer higher yields of alfalfa

Scientists* have shown that when proper amounts of Moly are added to acid Moly-deficient soils in New Jersey, marked improvement in yield and protein content of alfalfa results. Both field and laboratory tests were conducted upon the benefits resulting from the proper use of Molybdenum. In many areas of New Jersey centuries of leaching have robbed the soil of much of its available Molybdenum. With this deficiency corrected, alfalfa yields showed improvement of over 12%.

Experience of Mr. Clyde Speck demonstrates this notable improvement

On his farm near Asbury, New Jersey, Mr. Speck has a field of some 14 acres planted to alfalfa. His yields on successive cuttings decreased, and finally Mr. Speck decided to put the field to other use.

"About this time," said Mr. Speck, "I showed this field to a salesman for a fertilizer company. He examined my soil and told me that other farmers in this area had been having trouble with alfalfa. He suggested that we use Moly on this field of mine, and then re-seed.

"We applied Moly, about 2 to 3 ounces per acre. We had the Moly mixed with my regular fertilizer, and then I re-seeded. For the three years since I applied Moly to this field I have had good stands of alfalfa and the yields are fine. Moly made the difference."

*Evans, H. J. and Purois, E. R. (Rutgers University) "Molybdenum status of some New Jersey soils in respect to alfalfa production".—Agronomy Journal 43:70-71 (1951).

All crops need Moly, as shown by widespread tests in U.S. and abroad

During the last 15 years tests made in many parts of the United States and abroad show conclusively that all crops need Moly in a form that can readily be assimilated. When available Moly is not present in the soil Moly should be added, either alone or combined with fertilizers.



"My alfalfa field now has a full stand," says Mr. Speck, "and I feel that with its Moly-deficiency corrected it will continue in high production for several years."

It will pay you to find out now whether your own soil can benefit from the use of Moly

If you are getting low yields on crops such as alfalfa, cauliflower, tobacco, lettuce, beets or citrus, get in touch with your County Agent. He will be glad to help you set up test plots.

Write for our Bulletin: "Testing for Molybdenum Deficiency". Address Dept. 43, Climax Molybdenum Company, 500 Fifth Avenue, New York 36, New York.

MOLY CAN BE ADDED TO ANY FERTILIZER BLEND

When ordering fertilizer you can always specify that Molybdenum be included as an additive.

CLIMAX MOLYBDENUM

Clark Truck

Gondolas and high sided trucks can now be loaded directly by tractor shovels fitted with a new high-lift bucket. The new attachment, designed by the Construction Machinery Division of Clark Equipment Co., Benton Harbor, Mich., for its Michigan shovels, increases dumping height of the bucket by 3 ft., 7 in. It raises the lower edge of the bucket to 12 ft., 1 in.



New Ladcote Bag Linings

A new "Ladcote" modified polyethylene coating for multiwall bags was developed recently by the L. A. Dreyfus Co., South Plainfield, N. J. The new material gives a reported 25% greater resistance to the transmission of moisture vapor than conventional polyethylene of an equal coating weight, and in addition, has very good release properties. The Ladcote coatings are also said to have demonstrated high resistance to acids, alkalis, and moisture.

Hough's Tractor-Shovels

The Frank G. Hough Co., Libertyville, Ill., announced recently the introduction of two new four-wheel-drive, pneumatic-tired, "Payloader" tractor-shovels, the model HH with a payload capacity of $1\frac{3}{4}$ cubic yards, and the model HU with a payload capacity of $1\frac{1}{3}$ cubic yards.

The company has incorporated several new features into both units, including the new "Paylomatic" power-shift transmission, which reportedly eliminates the necessity of coming to a stop for a "range-shift." The torque-converter gives infinite speed ratios for maximum performance, with both transmission and torque-converter using standard SAE-10 HD oil.

USDA Issues Weevil Booklet

A new eight-page leaflet, describing methods for control of the alfalfa weevil, was published last month by the USDA. Leaflet No. 368, "The Alfalfa Weevil: How to Control It," describes the pest's way of life and discusses its control through correct crop management and use of insecticides.

One new approach to weevil control described is by introduction of a small, black wasp that often kills 80 to 90% of early season weevil larvae in the western states. The publication also discusses precautions in handling insecticides, including necessary waiting time before livestock are grazed on sprayed or dusted alfalfa. Single copies of the leaflet are available at the Office of Information, USDA, Washington 25.

Handbook of

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THE original publication "Properties and Commercial Sources of Insecticide Dust Diluents and Carriers" prepared by T. C. Watkins and L. B. Norton of Cornell University has been brought up to date and completely revised by Drs. Weidhaas and Brann. The new edition contains commercial information as well as data obtained in research conducted at Cornell University, Ithaca, New York.

The book is bound in a flexible leatheroid cover, for handy, practical use.

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Equipment & Bulletins (Continued)

Nitrogen Solutions Booklet

A new, 48-page nitrogen solutions handbook for the fertilizer and chemical industries was published recently by Nitrogen Division, Allied Chemical & Dye Corp., New York.

The new book contains the most up-to-date nitrogen solutions technical data available. It describes the chemical and physical properties of solutions and how to store, handle, and use them in fertilizer manufacturing. The book also presents new information on granulation and formulation of fertilizers. Numerous formulas and conversion factors also are included.

The handbook is fully illustrated with scenes of typical fertilizer manufacturing and solutions handling arrangements. Copies may be obtained by writing to Public Relations Department, Nitrogen Division, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.

Sackett Star* Granulator

The machine illustrated is said to offer fertilizer manufacturers a new approach to the problem of granulating mixed fertilizers. The equipment is offered by A. J. Sackett & Sons Co., Baltimore, Md.

By applying an intense rolling action to the material to be granulated, this new machine substantially increases product recovery and, at the same time, achieves a corresponding reduction in the percentage of recycle. Several of these new units are already in commercial operation.

*U. S. and Foreign Patents Pending



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NAC STORY

(Continued from Page 40)

ceptions based upon unrealistic rules and regulations, agricultural specialists will have to abandon the time-honored practice of preparing practical spray schedules and pest control recommendations.

"Probably the most significant development in USDA's current operations," reported John T. Coyne, Pesticide Regulation Section, USDA, is the present pesticide residue survey. In an effort to assist registrants, growers, recommending agencies and State Regulatory Officials, a survey has been initiated to determine the status under Public Law 518 of every food or feed use now registered under the Federal Insecticide, Fungicide, and Rodenticide Act. These uses are being compiled on a chemical by chemical basis. Tabulations and summary sheets are being prepared for each chemical," he reported. "The tabulations of registered uses list the more common formulations of the particular chemical; the tolerance, if any, which has been established for each crop; the customary dosage ranges registered, and any limitations upon each use.

"USDA personnel have tabulated and summarized the status of food and feed uses for almost two hundred pesticide chemicals. These listings have been made available to this Association for transmission to the basic manufacturers of the chemicals concerned. These folks in turn have been asked to analyze our evaluations and give us their comments and any supplementary information which they may have.

"After the industry has had an opportunity to review and comment on the tabulations and summary sheets, they will be returned to USDA for final evaluation. The next step will be actual publication and distribution of the conclusions."

Discussing the question of "realistic tolerances," Mr. Coyne emphasized that "the USDA can't carry the ball alone. If we are to have realistic tolerances, tolerances that grow-

ers can live with, petitioners must help. It is reasonable to assume that they are better acquainted with the use of their materials than any other single group. If they recognize unusual conditions that warrant tolerances higher than a mere analysis of the data indicate, they should spell out these conditions. I'm sure they'll be given full consideration. We feel that Section G of the petition can be used for this purpose. We would like to see it more frequently used. We believe that the time and effort spent in developing this section will pay dividends in practical tolerances that can stand longer without revision."

The work the NAC has done in connection with the Miller Amendment was reviewed by J. A. Noone, NAC technical advisor. A survey of member companies on the operations of the law, he said, showed that there was no criticism of the legislation as such; in fact, there was general support of it.

"It appear to us that some of the difficulties which have arisen in

the past have resulted from a lack of understanding and appreciation by both industry and government representatives of the other man's viewpoints, problems and limitations. Industry representatives have not always recognized the specific requirements of the law and the reasons for them. Government representatives have not always recognized the fact that industry needs prompt and decisive answers and cannot continue indefinitely to conduct expensive research tests to obtain more data.

NAC plans to hold a seminar or conference later this year to discuss the principles and procedures involved in the law. It will be designed primarily for individuals handling tolerance and registration matters for the companies. The Food and Drug Administration and USDA will cooperate in the seminar.

The NAC staff each reported to the association members the particular responsibilities of their jobs. Don Miller outlined his work on publicity and public relations; Kim Karabatsos

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reported on his work dealing with the various NAC services; W. Moreland, consultant to NAC summarized his job; and Miss Lee Grobe reported on the interrelation of the various branches and how the office staff fits into the picture.

"THE greatest infestation of cropland is from roadsides," declared Raymond J. McMahon, president of McMahon Bros., Binghamton, N. Y., at the special panel on the place of pesticides in the expanded highway program. Pointing out that not even 10% of highways are under chemical control, Mr. McMahon said this small figure was in spite of the fact that there is "no longer a single valid excuse for not using chemicals in highway control!"

Mr. McMahon's theme was amplified by the three other speakers on the NAC panel: William C. Greene, landscape engineer for the Connecticut State Highway Dept.; Dr. C. O. Eddy, chairman of the chemicals subcommittee of the American Road Builders' Association's committee on roadside construction and maintenance; and H. F. Clemmer, coordinator of technical activities, American Road Builders' Assn. Jack Dreesen, NAC herbicide specialist and panel moderator, delivered the address of the absent Mr. Clemmer, who is also a member of the District of Columbia Highway Commission.

Mr. McMahon illustrated possibilities for effective control of roadside weeds and grasses by showing colored slides of his firm's work along the New York State Thruway,—

at present the longest superhighway in the country. He described how economical use of herbicides has substantially reduced both highway maintenance costs and accident risks, also stressing the safe eradication of rag weed, poison ivy, and other noxious weeds. As an example of the monetary advantages of a complete herbicide program, he pointed to Steuben County, N. Y., which is accomplishing a control job with an annual expenditure of \$20,000 for chemicals which formerly cost \$65,000 by mechanical means.

Mr. McMahon's slides illustrated various "before-and-after" situations in New York and New Jersey. He emphasized that the use of herbicides can help reduce the figure of 9% of all fatal highway accidents which are attributable to obstructions along roadsides. "The cost of this particular type of accident to insurance companies was \$270 million in 1955, and the cost of these accidents to the people involved cannot even be estimated," he declared. "Control of vegetation along highways may be done infinitely better by chemical means than by other existing means, and at half the present cost of such other means."

He attributed part of the hesitancy to use pesticides to the early abuse in the application of chemicals, some early shortcomings of the chemicals themselves, and the reluctance on the part of highway superintendents to use chemicals without better equipment than was previously available.

"These impediments have long

been overcome, yet there persists a strange reluctance to abandon the practice of repeated, hazardous and expensive mowing and hand cutting operations; and abhorrent unwillingness to desist in the morally questionable practice of directing workmen afoot into areas infested with poison ivy; a sleepy response to the notion that there is even the slightest service due a hayfever sufferer from a highway department," McMahon charged.

Mr. Clemmer gave some idea of the tremendous field that is opening up to the pesticide industry with the passage of the \$50 billion highway expansion program in the next 13 years. "This is the largest public works program ever passed in peacetime," he declared, "and a substantial portion of it will go to landscaping and weed and pest control."

Mr. Clemmer pointed to the American Road Builders Assn. as a valuable tool in instituting chemical control over weeds and pests in the new program. "The aim of the committees of the American Road Builders' Assn. is to assist in furnishing information which will lead to the use of the most modern materials, equipment, and methods of construction."

Dr. Eddy's address outlined the work of his subcommittee on chemicals, stressing that far too few highway men know of the values of chemical control of pests along highways. He described the education problem with these individuals, whom he said are more familiar with the problems created by chemicals than with the

(Continued on Page 133)

BAGGING EQUIPMENT

(Continued from Page 49)

volt, 60 cycle, with a built-in transformer in the control box. The controls are mounted in a dust-tight enclosure and dust-tight micro-switches are used. A belt feeder, driven by a 1 h.p. gearhead motor, is an integral part of the scale. Feeder stops at the completion of each weighing. The belt carries a twenty inch stream. The hopper door is discharged by air cylinder rather than a solenoid. Scale can be activated by a bagholder switch, pushbutton, foot pedal or timer. A new "take-away" bag conveyor and automatic bag sewing equipment are both available as optional added features to supply a complete, compact fertilizer bagging operation.

BLACK Products Co., Chicago, offer a new "Airflow" valve bag packer, designed to fill bags of from 10 to 125 pounds. Tonnage packed per hour and accuracy of packed weight vary with material being packed. Close weight tolerances are possible. A 110 volt AC power supply operates the unit. Air required ranges from 4 to 12 cfm, which can be supplied by any standard low capacity air compressor. Absence of noise and vibration and an unusually clean bag filling operation are advantages claimed for the unit, — also versatility as it can be adapted to filling drums and pails as well as bags. Prod-

ucts can be packed with no breakdown in size of particle or flake. Scale hangers and tilting bag support saddle are optional added equipment, to facilitate closing the valve opening on large bags with tuck-in sleeves.

BLACK Products Co. also offer an auger type valve bagpacker designed to handle a wide range of free-flowing, dry granular materials and to fill bags of from 25 to 125 lbs. packed weight. It is electrically operated by a totally enclosed 2 HP motor. Weight is approximately 1,000 lbs., and dimensions: height 54", width 24" and length 49½". It features low cost, accurate, fast and clean filling of a wide range of dry products.

THE SOUTHLAND PACKER — From Page 49

than one packer is in use. No air or hydraulic fittings are used, thereby eliminating the need for supplemental equipment.

The "Southland Packer" is made from 12 gauge or heavier steel plate and requires no external bracing for rigidity. The feeder is of the continuous operating type, using a ½ H.P. gear-enclosed motor to operate its endless belt, over 8" self-cleaning pulleys. The large diameter of the pulleys together with their self-cleaning feature increases belt life.

Complete information about the packer can be obtained from The Chase Bag Company, P.O. Box 1590, New Orleans, La. Model A "Southland Packer," con-

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Besides fertilizer, the "Southland Packer" is designed to pack granular or free-flowing materials of many kinds.★★

Climax Molybdenum Bulletin

"A Guide to Sources and Applications of Molybdenum Chemicals," a new four-page bulletin, was issued by the Climax Molybdenum Co., Dept. L, 500 Fifth Avenue, New York 36. It presents information which is designed to help fertilizer manufacturers and other industrial users to select the most economical and convenient starting materials for molybdenum chemical applications. Over 50 molybdenum chemicals for research purposes are listed in the bulletin.

ACS MEETING

(Continued from Page 62)

customers and prospects as the most important factor in the distribution of pesticides. "Good distribution practices require the movement of our products into market areas well in advance of use periods on a firm order basis."

The Niagara official stressed the importance of sales personnel, calling them the "country doctors" of the pesticide industry. "They must be specialists in problems relating to horticulture, entomology, pomology, agronomy, and, at times, help solve the customers' personal problems," he declared.

As areas of immediate need, Mr. Hertel listed the development of systems, soil treatment control of insects, and use of antibiotics.★★

ENTOMOLOGY CONGRESS

(Continued from Page 66)

canopy penetration and under-leaf coverage is required, as with the green peach aphid on potatoes. Spe-

cially designed ground spray and dust applicators, he said, have been developed for controlling these pests.

Reports on Regulations

Several discussions were held by American, Canadian and British representatives on legal insecticide tolerances affecting crops. L. S. Hitchner, NAC, USA, presented an overall picture on the effects of tolerances in the United States; W. B. Rankin, USDA, reviewed the establishment of pesticide tolerances in the U. S.; and Charles Palm, Ithaca, commented on this topic with reference to the influence on research. M. G. Allmark, Ontario, Canada, presented the Canadian views and policies regarding legal insecticide tolerances.★★

PESTICIDE OUTLOOK

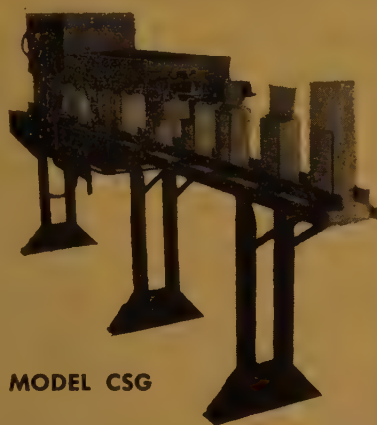
(Continued from Page 52)

we permit their destruction by insect pests and rodents. The constant battle against rodents alone represents an area of great importance not only in

this country but in many of our nearby islands as well as in foreign countries.

The wide scale protection of our forests, woodlands, shade trees, and parks will be an important contribution to the preservation of our natural resources and the beauty of our cities; also the preservation and protection of our grasslands and other lands that remain idle from cultivation. It is just as important to keep these lands free of insect pests, obnoxious weeds, and rodents as it is to protect a specific crop.

In addition to all this, it is well known that our population is increasing, which means an increasing need for food and fiber crops, which in turn means increased needs and more effective use of our products. This applies not only to the United States but the same thing is happening to our neighbors north of the border and south of the border. Also, there are expanding possibilities for the products of our Industry in other foreign countries if we do our job right.★★



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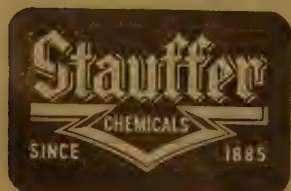
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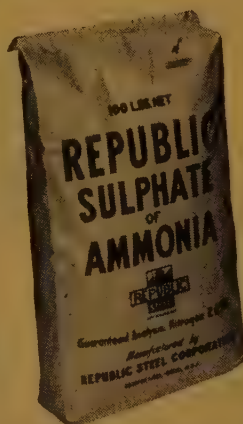
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NEMAGON IN S. C.

(From Page 73)

were used, varying from 2.5 to 40 gallons per acre. Nontreated trees were left as controls. An area of 100 square feet (1/435.6 of an acre) surrounding each tree was treated. Nemagon was injected into the soil at a depth of 12 inches on 12-inch centers. Three milliliters of material were released at each injection. At the high rate of 40 gallons per acre nondiluted Nemagon was used. Lower rates were obtained by appropriate dilution with kerosene. At the time of application, April 19, tree circumference measurements were recorded. Data on tree vigor and appearance were taken at irregular intervals during the summer.

On September 22, 1955, the following data were recorded: shoot length, tree trunk circumference, root-knot symptoms, Nemagon phytotoxicity to tree roots, and tree vigor (Table 2). Root-knot infestation was rated from zero (roots free from root-knot symptoms) to 5 (roots showing severe root-knot infestation). Practically no root-knot galls appeared on new root growth at the higher rates of Nemagon application (5-40 gallons per acre).

As shown in Table 2, the nontreated tree roots examined were moderately to severely galled. Nemagon at the rate of 2.5 gallons per acre failed to give satisfactory root knot control. However, at the 5-gallon-per-acre rate, there was good shoot growth with satisfactory root-knot control, accompanied by fair to excellent tree vigor. The greatest increase in tree trunk circumference occurred at this rate. The 8-gallon-per-acre rate resulted in a slightly superior nematocidal effect; tree growth and vigor were also good at

this rate. The optimum treatment would appear to be between 5 and 8 gallons of Nemagon per acre. The 10 gallon-per-acre rate gave effective nematode control, but there was a suggestion of root phytotoxicity, while 20 gallons per acre resulted in definite tree stunting. At the rate of 40 gallons per acre there was extreme root phytotoxicity resulting in death of the trees.

Some of the unanswered questions are: 1) How long will an effective nematocidal treatment protect a peach tree before re-infestation occurs? 2) What reduction in the soil nematode (root knot) population occurs? 3) What dosage rate of Nemagon effectively kills root-knot nematodes within root galls? 4) Will Nemagon treatments during fall or winter be equally as effective as treatments during spring and summer? Additional experiments to answer these questions are in progress, including a comparison between granular and liquid Nemagon.★★

PETROLEUM SPRAYS

(From Page 44)

successfully over a period of years are as follows:

	No. 1	No. 2
Gravity, °API	14	9.5
Specific Gravity	.972	1.004
Color	Straw	Straw to Brown
Flash Point, °F	250	280
Mixed Aniline Cloud Point, °F	83	75
Distillation, °F		
Initial Boiling Point	470	520
Final Boiling Point	580	640

Summary

EMULSIFIED insecticide sprays containing aromatic petroleum solvents can be used for spraying crops without causing injury to the plants, providing the proper degree of emulsification is maintained. To determine if an emulsion is of satisfactory quality, a simple procedure is described in which the physical appearance of the film laid down by an emulsion is observed and classified. As another means of evaluating an

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emulsion, a test involving greenhouse-grown potted plants, is described.

Photomicrographs of satisfactory and unsatisfactory emulsions are included, as well as photographs showing the effect of these emulsions on the foliage of bean plants. Adequately emulsified oils show a uniform dispersion of the oil, lay down a thin, continuous film of oil when dried, and have no adverse effect on the leaves or growth of the plant. As coarser emulsions are used, progressively greater damage to the crops can be expected.★★

WASHINGTON REPORT

(From Page 77)

farmer is going to mix and apply a chemical, and that in the heat of the day with the perspiration running down his nose, there is only so much of the fine print that he will absorb.

* * * * *

Over 1,080 radio stations have requested the Fourteenth Farm Radio News Service series issued by Louis Wilson, Director of Information, National Plant Food Institute. This series, which has been enjoying increasing popularity, provides an opportunity for outstanding authorities in the agricultural field to personally voice their sentiments and recommendations to what is probably the largest radio farm audience in existence today.

The four agricultural leaders whose special farm reports make up this latest release are:

True D. Morse, Under Secretary of Agriculture, U. S. Department of Agriculture — "The Soil Bank and Soil Fertility."

Dr. H. B. James, President, American Farm Economic Association, and Head, Department of Agricultural Economics, North Carolina State College, — "Dollars and Sense of Soil Fertility."

Dr. Irvin Stewart, President, American Association of Land-Grant Colleges and State Universities, and President, West Virginia University — "Land-Grant College Research Pays Off."

Dr. Karl S. Quisenberry, Director, Crops Research, Agricultural Research Service, USDA,—"Better Crops for Less Money."

* * * * *

Agriculture's five star mystery of the moment is — "What happened to the melon fly's mate?" As of this writing a single melon fly was trapped on the campus of UCLA in California. Since then more than 2,500 traps have been set. The result—no more flies have been found. The melon fly, which causes havoc to a wide range of fruits in the melon class, is closely related to the Mediterranean fruit fly and the Oriental fruit fly, both found in Hawaii. The United States has been considered free of the melon fly.

Authorities believe the fly may have come in with one of the exchange students or exchanges of technical men between UCLA and the

University of Hawaii. Checks have been made and apparently all baggage and so forth was properly fumigated. But it's entirely possible that this one fly squeaked through.

According to Dr. W. L. Popham, Director, Crops Regulatory Programs, Agricultural Research Service, U. S. Department of Agriculture, this catch emphasizes the importance of maintaining constant surveillance against the introduction of insect pests. Spotting an outbreak early and treating it immediately can save millions of dollars later on.

As soon as this fly was spotted, the entire area was sprayed with malathion. It may be that for once we were lucky and spotted the outbreak immediately and wiped out the fly's mate.

* * * * *

"We're on the better side of the problem," says Dr. W. L. Popham,

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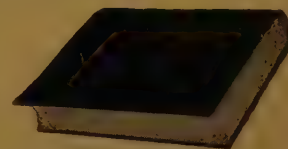
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in commenting on the status of the Mediterranean fruit fly campaign in Florida. The acreage under treatment which once reached 615,000 acres is now down to 250,000 acres.

"We're entering the mop-up stage," Dr. Popham continues, "although some of us are a little apprehensive about when we'll catch the last bug."

The Florida drought which had devastating effect on some of the agricultural interests, actually helped the control program inasmuch as the pesticides remained effective over a long period of time. It's been raining quite a bit in Florida recently, however, and this is hampering the control program currently to some extent. Soil treatments are being limited to trees of known infestation.★★

GRANULE FORMATION

(From Page 35)

prove the rolling characteristics, with resulting improvement in range size of the granules. Tests with large particle size potash salt and superphosphate containing particles up to 2 mm size confirmed this observation.

It is essential that good rolling characteristics be obtained immediately after the addition of water. Raw materials having particles less than 1 mm size tend to slump at this stage rather than roll. Slumping prevents good agglomeration and reduces the efficiency of producing granules within the desirable range of 1.5 to 4 mm size.

f. Adding recirculated fines to raw materials:

It is common practice to return fines to the mix with fresh raw ma-

terials. This alters the size grading of the final mixture. The fines influence granulation in two ways: they reduce slightly the net amount of water required for granulation and they provide coarser particles to the raw feed which promotes better rolling in the granulator. Plant difficulties with fines were traced to variations in fines, that is, ratios of raw materials. To avoid the problems associated with recycling fines it was found necessary to mix these fines thoroughly with the raw materials and then control artificially the rate of addition to the raw materials so as to maintain a constant ratio.

g. Effect of sprays versus jets for addition of water:

In a few tests it seemed that using an open water jet in place of sprays improved the granulation. Further tests were made in the experimental unit to check on these observations. It was then found that the jet water increased the amount of oversize granules. Investigation in full-scale units confirmed this: where jets had proved superior to sprays, the spray had been placed too far from the rolling bed of material. This caused the spray mist to spread to the uncovered surface of the granulator shell. The rolling material tended to stick to the wetted shell surface and eventually it broke away in large lumps which formed oversize. By placing the sprays close to the rolling material, the spread of the spray mist to the shell surface was prevented, giving superior results over the open jet.

When the spray plays on the material which is cascading as it should, the water has a better chance to penetrate and distribute itself throughout the falling curtain of material. (See Fig. 3, Spray 2.)★★



FIGURE 1



FIGURE 2



FIGURE 3

Results of 1955

FUNGICIDE TESTS

Published from LABORATORY OF PLANT PATHOLOGY, April, May and June, 1956

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The complete results of 1955 fungicide tests, listing response of various crops to commercial and experimental fungicides are contained in a 20-page, bound booklet.

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NAC REPORTS

(Continued from Page 122)

ones they solve. Improved equipment, techniques, and removal of the volatility of the pesticides have made these problems obsolete, he declared, but these advancements haven't been widely publicized among the highway builders.

"There is a real need for the development of schedules and practices . . . as well as development of programs to guide public, research organizations, etc.," observed Dr. Eddy, who described how his subcommittee is using the extension service, state colleges and experiment stations, to spread information about the possibilities of the chemical control of pesticides along highways.

Mr. W. C. Greene described the problems peculiar to Connecticut, plus other problems of general interest to all states contemplating chemical control of highway pests. "Since inception of chemical control in our state," Mr. Greene said, "there have been 90% less accidents among main-

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tenance help. The 2000 miles of guide rails along highways in Connecticut had made it extremely hazardous and difficult to control weeds, until this present chemical program was instituted."

A particular problem facing New England States, Mr. Greene pointed out, was preservation of shade trees and shrubs which enhance real estate and have aesthetic values. For this reason, he said, 46% of the total chemicals used by Connecticut fall into the category of insecticides and fungicides, and 54% into the category of herbicides.

Mr. Greene held out high hope for the use of growth inhibitors and growth regulators which would control the height to which grass will grow. "It is our contention that with the development of these chemicals that are now progressing through research, we will be using them very extensively in the future," he said.

In the question and answer period after the four principal addresses, Mr. McMahon was asked about damage suits brought by property owners who may have suffered crop damage from herbicides. "I would say that such damage payments do not exceed

one cent per mile of any spraying operation," he declared, "and in nearly every case it was a result of something (like a line of roses) that either shouldn't have been there, or were completely hidden by covering foliage. In practically every case, the property owner gave every indication of appreciating and understanding our problems."

Two other reports presented at the meeting are reported in full elsewhere in this issue: Dr. E. F. Knippling's address on "Entomology Research in the USDA" appears on page 52; and Jack Vernon's "Pesticide Industry Outlook" appears on page 50.

Three new members were elected to the Association's Board of Directors. They are: Arthur W. Mohr, California Spray Chemical Corp., Richmond, Calif.; George R. Vila, Naugatuck Chemical Division of U.S. Rubber Co., Naugatuck, Conn.; and T. L. Wilkerson, American Cyanamid Co., New York, N. Y.

Two members who retired from the Board of Directors were: Paul Mayfield, Hercules Powder Co., Wilmington, Del., and August Petrus, Cotton States Chemical Co., West Monroe, La.★★

New-Type Dusting Device

Agricola, Ltd., London, England, announced recently a method of electrostatic crop-dusting, which it claims will be four to ten times more effective than conventional methods. The device is incorporated in the "Agricola Electro-duster."

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Index to ADVERTISERS

Agricultural Chemicals, Inc.	Sept.
African Pyrethrum Development, Inc.	Sept.
American Agricultural Chemical Co.	79
American Cyanamid Co.	32
American Potash & Chemical Corp.	70
W. R. E. Andrews Sales, Inc.	115
Arkell Safety Bag Co.	18
Antara Chemical Div., General Aniline & Film Corp.	28
Ashcraft-Wilkinson Co.	10
Atlantic Refining Co.	Sept.
Atlas Powder Co.	Sept.
Bagpak Div., International Paper Co.	26
Bell Clay Co.	123
Bemis Bro. Bag Co.	30
Berkshire Chemicals, Inc.	113
Bradley Pulverizer Co.	Sept.
Burlap Council, The	96
California Spray Chem. Co.	Sept.
Capper Publications	130
Carbide & Carbon Chemicals Co.	74
Chemagro Corp.	16
Chemical & Industrial Corp.	67
Clark Equipment Co.	25
Climax Molybdenum Co.	116
R. D. Cole Mfg. Co.	128
Combustion Engineering, Inc. Raymond Division	12
Commercial Solvents Corp.	Sept.
Continental Can Co., Shellmar Betner Div.	20
Cox, Dr. Alvin J.	133
Davies Nitrate Co., Inc.	127
Davison Chemical Co., Dept. of W. R. Grace & Co.	51
Deere & Co., Grand River Chem. Div.	Sept.
Diamond Alkali Co.	100
Darr-Oliver Co.	102
Daw Chemical Co.	120
L. A. Dreyfus Co.	59
Duval Sulphur & Potash Co.	10
Eastern States Petroleum Co.	87
Emulsol Chemical Corp.	Sept.
E. I. du Pont de Nemours & Co.	84

Fairfield Chemical Div., Food Machinery & Chemical Co.	27
Floridin Co.	Sept.
Fry Co., Geo. H.	125
Fulton Bag & Cotton Mills	21
Geigy Chemical Co.	78
General American Transportation Corp.	114
Glendon Pyrophyllite Co.	130
Grand River Chemical Division of Deere & Co.	Sept.
Greeff & Co., R. W.	Sept.
Grinnell Co.	112
Hammond Bag & Paper Co.	July
Hardinge Co.	109
Heckathorn United & Co.	Sept.
Hercules Powder Co.	4th Cover
Hudson Pulp & Paper Corp.	80, 81
International Minerals & Chemical Corp.	3, 14, 15
Johns-Manville Co.	13
Johnson, C. S. & Co.	Sept.
Kennedy Minerals Co., Inc.	132
Kolker Chemical Co.	Sept.
Koppers Co.	128
Kraft Bag Co.	9
Lancaster, Allwine & Rommel	132
Lion Oil Co.	Sept.
Lummus Co.	108
Luria Engineering Co.	110
McLaughlin Gormley King Co.	128
Michigan Chemical Corp.	24
Mine Safety Appliances Co.	Aug.
Minerals & Chemicals Corp. of America	Sept.
National Potash Co.	98
National Agricultural Chemicals Assn.	122
National Aniline Div., Allied Chem. & Dye Corp.	Sept.
Naugatuck Chemical Division, U. S. Rubber Co.	Sept.
Niagara Chemical Division, Food Machinery & Chemical Corp.	Sept.

Ninol Laboratories, Inc.	Sept.
Nitrogen Div., Allied Chem. & Dye Corp.	6, 7
Oldbury Electro Chemical Co.	130
Olin Mathieson Chemical Corp.	2nd Cover
Pacific Coast Borax Co.	Aug.
Penick, S. B. & Co.	Sept.
Pennsylvania Salt Manufacturing Co.	Sept.
Phelps Dodge Refining Corp.	54
Phillips Chemical Co.	22
Polychemicals Division, West Virginia Pulp and Paper Co.	Aug.
Potash Company of America	3rd Cover
Powell, John & Co.	2nd Cover
Prentiss Drug & Chemical Co.	Sept.
Private Brands, Inc.	Sept.
Raymond Bag Corp.	11
Raymond Division, Combustion Engineering, Inc.	12
Refined Products Corp.	Sept.
Republic Steel Corp.	126
Renneburg & Sons Co., Edw.	Sept.
Reideburg, Theodore Associates	133
Richardson Scale Co.	106
Rohm & Haas Co.	19
Sackett, A. J. & Sons Co.	90
Shell Chemical Co.	Sept.
Sinclair Chemicals	31
Sohio Chemical Co.	July
Southeastern Clay Co.	Sept.
Spencer Chemical Co.	29
Spraying Systems Co.	Sept.
Stauffer Chemical Co.	126
Stedman Foundry & Machine Co.	Sept.
Lewis T. Stone & Co.	123
Sturtevant Mill Corp.	92
St. Regis Paper Co.	Sept.
Southwest Potash Corp.	103
Summit Mining Corp.	Sept.
Tennessee Corp.	Sept.
Texas Gulf Sulphur Co.	118
Thayer Scale Co.	Aug.
Thos Alabama Kaolin Co.	122
Townsend, Dr. G. R.	133
Union Bag & Paper Corp.	63
Union Carbide & Carbon	74
Union Special Machine Co.	23
Union Standard Equipment Co.	132
U. S. Phosphoric Products, Div. Tennessee Corp.	17
U. S. Potash Co.	82
U. S. Industrial Chemicals Co.	Aug.
Vanderbilt Co., R. T.	111
Velsicol Chemical Corp.	4
Vulcan Containers, Inc.	107
West End Chemical Co.	68
Willson Products, Inc.	Sept.
Wisconsin Alumni Research Foundation	132
Woodward & Dickerson, Inc.	Sept.
West Virginia Pulp and Paper Co.	Aug.
Young Machinery Co.	121
Zonolite Co.	Sept.

Tale Ends

THOSE in charge of planning the program for the 23rd annual meeting of the NACA last month at Spring Lake, N. J., can chalk up a ten-strike, for not only was registration heavy for the meeting itself, but attendance at the meeting sessions was the biggest in years. The panel on what influences the farmer's de-

cision in his purchase of agricultural chemicals was the best attended single session we remember at an NAC convention. And the fact that such a high percentage of the audience stayed right through to the conclusion, were still in the hall at 12:30, and not on their way to the golf course or the beach, is a great credit to Monty

Budd, advertising manager for Hercules Powder, who arranged a very interesting program.

Convention attendance would have been bigger if some of the long-time 'regulars' had found it possible to be on hand. "Grub" Leonard missed his first convention in history, and only because the doctors had him in bed cutting out his appendix. Paul Mayfield, another past president, was also among those missing and missed. Paul had a valid excuse too. His second daughter was being married the day after the convention closed.

Four wedding anniversaries were celebrated on September 6th, night of the annual dinner. Dr. & Mrs. Decker and Dr. & Mrs. Shepard were on hand to celebrate their joint anniversary together, the 34th for the Deckers and the 32nd for the Shepards. Newt Hall, who arrived late, named the date as his 25th anniversary, while Irv Bales owned up to twenty.

The board presented a very handsome sterling silver tray to retiring president Bill Allen. Facsimile signatures of all the board members will make this a permanent memento for Bill—of the two years he spent as president of NACA.

The spring session of NACA,—next March—is to be held in San Francisco. We return to the Fairmount Hotel again, scene of an excellent meeting back in 1952.

Our faces were at least mildly red when we learned that president Eisenhower had change the complexion of one of the articles in our September issue (Congress Approves Program for Hyacinth Extermination) by deciding after we had gone to press not to sign HR 12080, the Public Works Omnibus Authorization Bill.

Thousands of embryo entomologists are being trained all over the country, as hobby stores report a rush for butterfly nets. Kids from two to ten have been pursuing butterflies all over the map this past summer, at least around the New York-New Jersey area, with a good sized corporal's guard active in and around the AC suburban offices. It's a regular science project, as we get the story, which is apparently gaining in popularity. And much better occupied the net handlers are, we opine, than in chopping up one another with switch blade knives or drowning cats.

The City of Milwaukee seems to have no end of trouble in defending its trademark rights to "Milorganite" fertilizer. The latest concern to incur the wrath of the City of Milwaukee for alleged infringement is Orchard Supply Building Co., San Jose, Calif., who has been marketing a product under the name "Soil-Organite."

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